DOUBLE SUPPLEMENT: ALASKA'S ICE AGE MAMMALS AND CANADA MAP

VOL. 141, NO. 3 MARCH 1972

NATIONAL GEOGRAPHIC



A LOOK AT ALASKA'S

TUNDRA

SEE "THE LAST VIKINGS" MONDAY, MARCH 27 ON CBS TV (page 434A)

OFFICIAL JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D.C.

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COVER: Early bird on the tundra, a Lapland longspur seeks out last year's seeds (pages 522-3)

POSTMASTER: SEND CHANGE OF ADDRESS FORM 3579 AND UNDELIVERED COPIES TO NATIONAL GEOGRAPHIC MAGAZINE, 17TH AND M STS. N.W., WASHINGTON, D. C. 20036

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3 Ninety-Eight is a superb road car. Olds' exclusive ride system incorporates a combination of engineering advances in chassis, suspension and steering. You negotiate scrubboard roads, chuckholes, hairpin curves and smooth interstate highways with ease.

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Sugar puts in the energy kids need in a form kids like. It not only helps youngsters stoke up fast, but the good natural sweetness gives them a sense of satisfaction and well-being.

Nutritionists say that sugar, as an important carbohydrate, has a place in a balanced diet. A diet that includes the right kinds and right amounts of protein, vitamins, minerals and fats, as well as carbohydrates.

Sugar. It isn't just good flavor; it's good food.





When elephants roamed the Arctic tundra

DRAWING ON THE PAST, artist-naturalist Jay H. Matternes translates science's accumulated knowledge of Ice Age Alaska into a striking panorama for the Smithsonian Institution in Washington, D. C. A reproduction of his preliminary full-color painting accompanies this issue; here he works in charcoal on the mural itself.

Like the Renaissance masters, Mr. Matternes blends outstanding artistry with a probing scientific mind. The world is his studio, from museum laboratories, where he studies the anatomy of animals past and present, to remote corners of Africa and the Andes, where he has gathered precise botanical and geographical details for his paintings.

Hailed for their accuracy, his works appear in museums, in national park visitor centers, and in books, including Dr. Jane van Lawick-Goodall's *My Friends the Wild Chimpanzees* and other National Geographic publications.

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The 36 men who have served as President of our great land are symbolic of America's majesty and her dedication to freedom for all men. Now, as the keen excitement and solemn purpose of another Presidential election draws near, The Danbury Mint is embarking on an ambitious program to pay tribute to the Presidency in the timeless medium of sculpture in precious metal — through the issuance of a series of 36 large-size solid *Sterling Silver Ingots*, each carrying a finely sculpted Presidential portrait.

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Think what this means! You would have to spend over $150.00 purchasing Eisenhower proof coins from the U.S. Government to obtain as much silver as is contained in a single Presidential Silver Ingot to be issued at $22.00.

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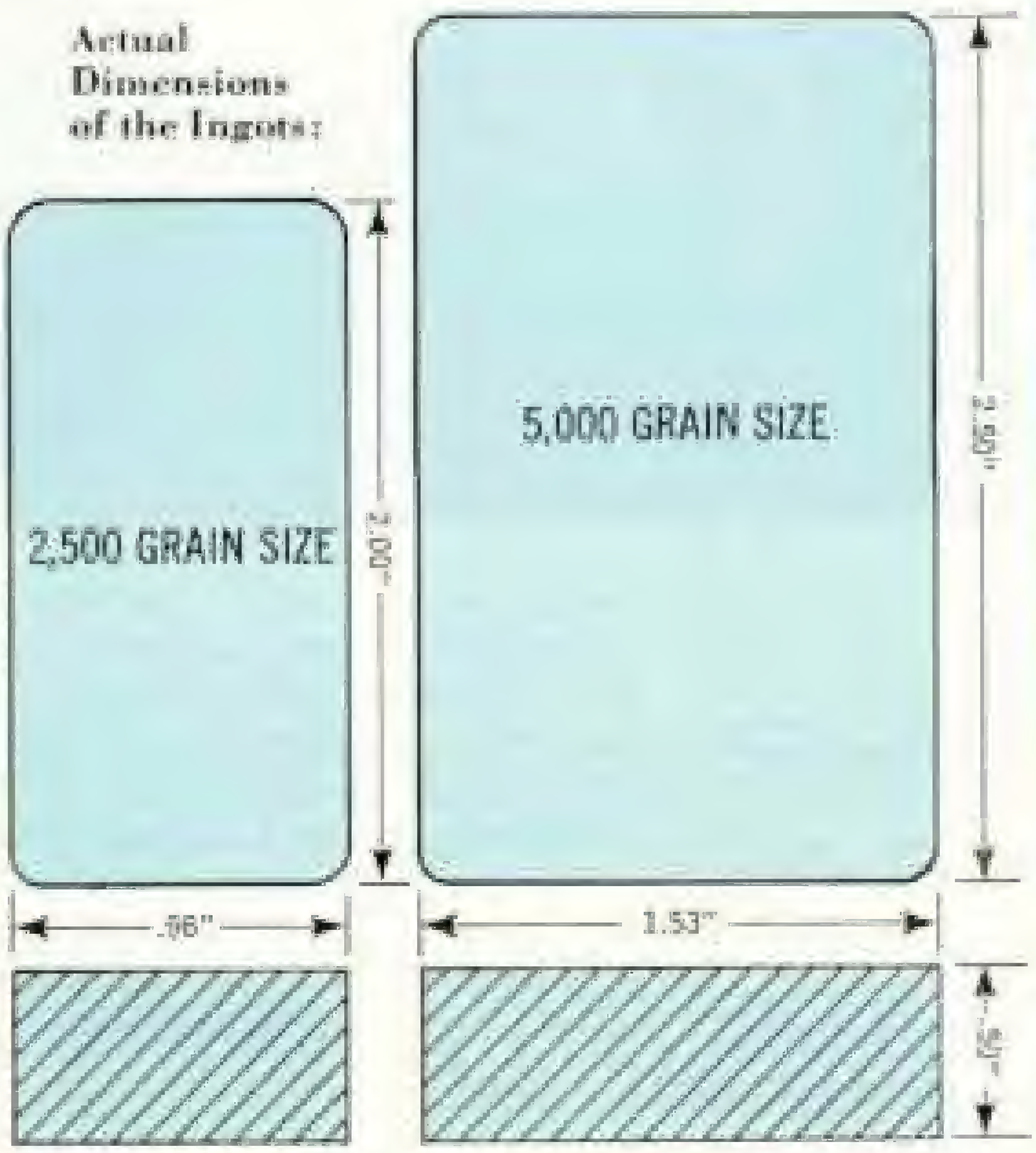
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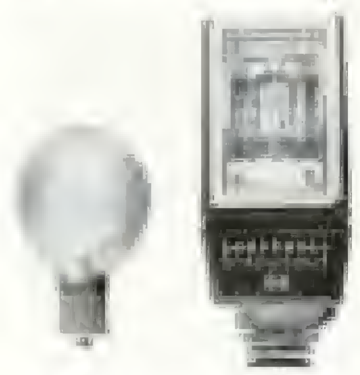
Think of electronic flash as a new, better and less expensive flashbulb that you can use over and over again.



More convenient. Some electronic flash units are about the size of a pack of cigarettes. Flashbulbs are much bulkier. And you always seem to run out just when you really need them.

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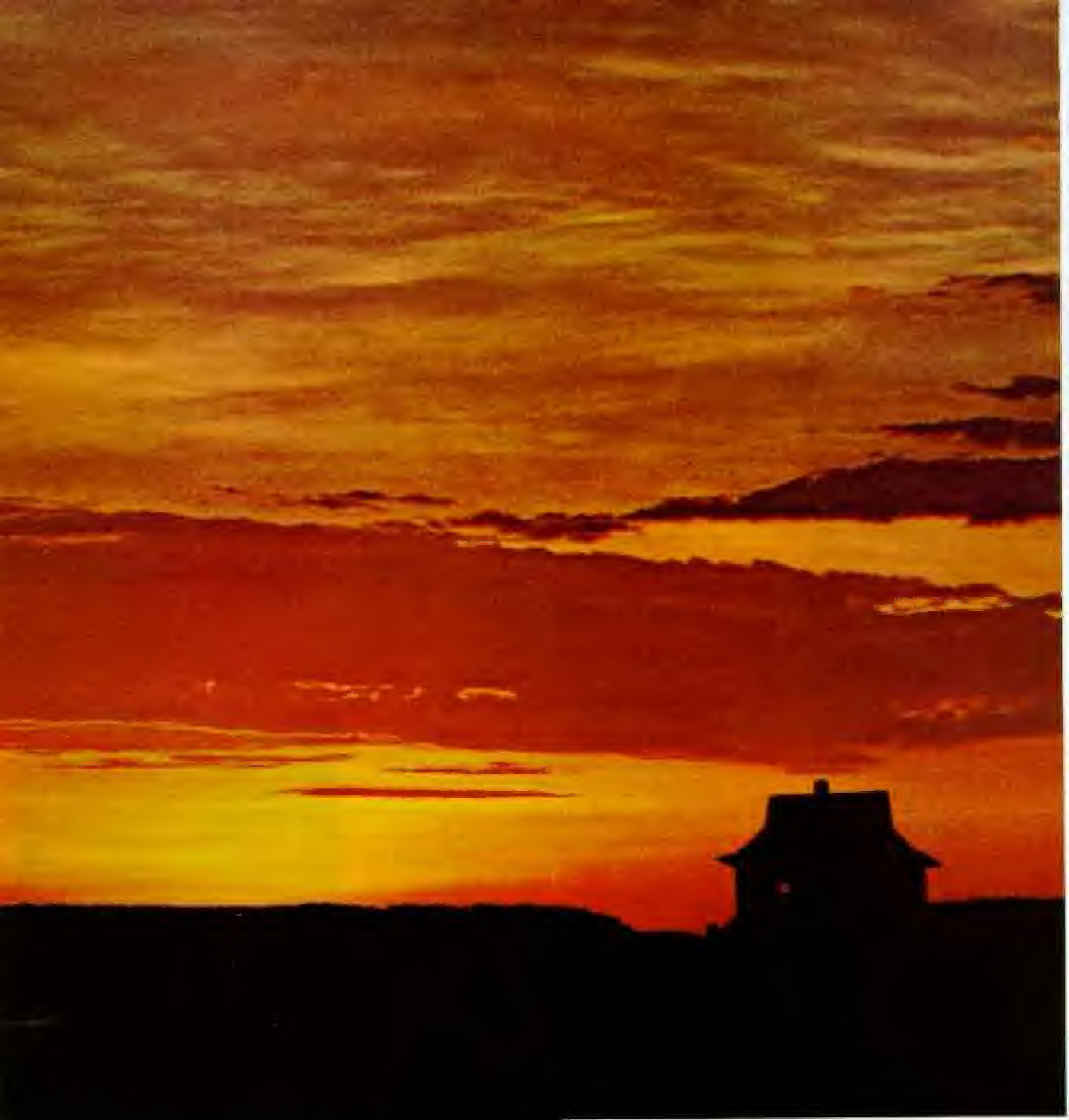
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This being so, may we recommend an early summer vacation.

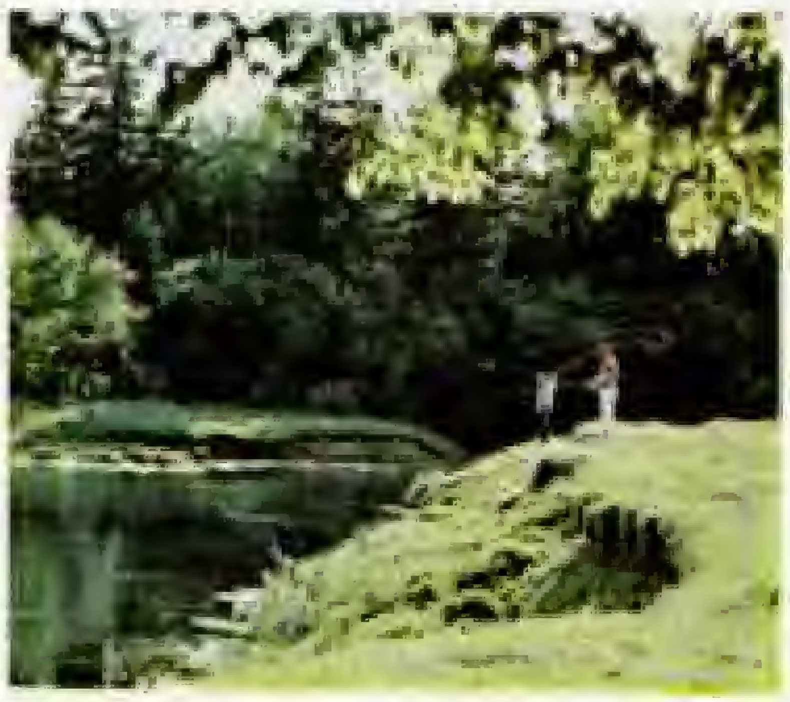
You could call it the most beautiful time of our entire year, and even the summer sun-worshipers and disciples of autumn's glory would not protest too much.

The time of May blossoming into the rare and perfect days of June.

In Nova Scotia, a time of lilacs and apple blossoms. Of crystal



lakes, and freshened streams, and rivers running full and free. Of beaches warming to an early sun.



Of a Spring moon's path soft upon the sea, moving with evening strollers on the shore.

This is the time when Nova Scotia seems Shangri-La to the golfer, the fisherman, the man who loves boats; to all those who feel that while life exists in cities—real living is only in the great outdoors. And in Nova Scotia, our great outdoors is never greater than in this green and growing time of Spring.

Yes, there are beautiful, spirit-lifting reasons for an early vaca-

Early summer







tion. But there are very practical reasons of convenience too. The early vacationer seldom stands and waits ... in stores, restaurants, information offices, traffic, or anywhere else. He has a greater variety and wider choice of accommodation. He drives less speedily to arrive, and more leisurely to see. He looks around the sites of our history, and re-lives the past with others like him; but not with crowds of others like him.



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The Great Imitator

Just so long as men and women, and boys and girls approaching maturity, are not taught to recognize the cruelest of all foes to health and happiness—just so long will many lives be utterly wrecked, lives which could have been saved or made decently livable.

Strange as it may seem, tens of thousands of victims of this insidious disease (syphilis) are utterly unaware of the fact that they have it and that its malignant poison is steadily and surely robbing them of health and strength.

No other disease takes so many forms. As it progresses, it may mask as rheumatism, arthritis, physical exhaustion and nervous breakdown. It may appear to be a form of eye, heart, lung, throat or kidney trouble. There is practically no organic disease the symptoms of which it does not simulate. No wonder it is called "The Great Imitator".

It is the imperative duty of each man desirous of protecting his own health—and more especially the duty of every parent anxious to safeguard children—to know its direct and indirect results.

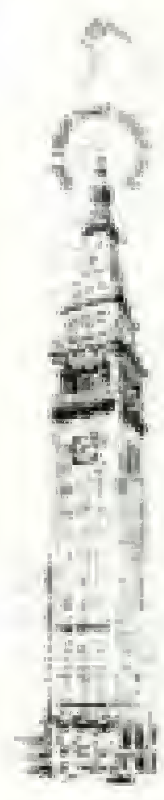
Syphilis is responsible for more misery of body and mind than any other disease. It destroys flesh and bone. Its ulcers leave terrible scars. It attacks heart, blood vessels, abdominal organs—and most tragic of all are its attacks upon brain and spinal cord, the great nerve centers, resulting commonly in blindness, deafness, locomotor ataxia, paralysis, paresis and insanity—a life-long tragedy.

Because of fear and ignorance, countless millions of victims have been wickedly imposed upon and hoodwinked by quacks, charlatans and worse—insidious blackmailers pretending to practice medicine.

The United States Government took a brave step forward during the Great War and told our soldiers and sailors the truth about this dread disease and what it would do if unchecked or improperly treated.

It can be cured by competent physicians if detected in time and if the patient faithfully follows the scientific treatment prescribed by his doctor. After the disease has been allowed to progress beyond the first stages, cures are less certain, but a great deal can often be done to help chronic sufferers.

Men and women should learn the truth and tell it in plain language to those dependent upon them for education and guidance. It is a helpful sign that the best educators deplore the old habit of secrecy and urge widespread knowledge and frank instruction.



It is estimated that more than 12,000,000 persons in the United States have or at some time have had syphilis.

From 5% to 40% of all the cases in the general hospitals of this country are found to be suffering—directly or indirectly—from this disease. The variance in the figures depends upon the character and location of the hospital.

According to Government statistics, the deaths of 200,000 Americans, each year, are directly caused by syphilis and associated diseases. But thousands of deaths charged to other causes are actually due to this disease.

Hospital and clinic records show that early infant mortality can be reduced one-half by pre-natal treatment of syphilitic infection.

The Metropolitan Life Insurance Company will gladly mail, free of charge, its booklet, "The Great Imitator." You are urged to send for it.

HALEY FISKE, President

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The year was 1927. And Americans were getting syphilis, a venereal disease that was sweeping the country.

But no one talked about it. They would just get it, and maybe die from it. Or end up a cripple.

So, the following year, we at Metropolitan Life ran a national advertisement about syphilis and its dangers.

By 1928 standards, the ad was shockingly direct. Not for children's eyes. Syphilis was a dirty word, but there it was in print.

At the time, 185,000 Americans had contracted the disease.

In fact, it had become an epidemic.

Right now, we're in the middle of another epidemic. It's estimated that almost two and a half million people have VD, either syphilis or gonorrhea.

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It's not just another boring booklet telling you VD is bad. It's filled with answers to blunt questions like these: If I kiss a person, can I get syphilis? How would I ever know if I had VD? Can I go to a doctor for treatment without his telling my parents?

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FORD DIVISION Ford

NATIONAL GEOGRAPHIC

March 1972

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North to the Tundra

A FRINGE of teeming life and desolation between the northern forests and the sea has become a land blessed with the promise of riches and cursed with the threat of ruin.

Inevitably man will put his mark on the tundra's lonely splendor; already, oil prospectors in Alaska have found vast wealth beneath its surface. Conservationists, hurrying north to protect this great virgin wilderness, tell us how fragile that surface is. Rock-hard in winter, like the hundreds of feet of frozen earth beneath it, it becomes so sensitive in summer that footprints may leave long-lasting scars.

Tundra plants grow where trees cannot—across sweeping far-northern plains of North America, Europe, and Asia, and above the timberline on alpine heights throughout the world.

Like a desert, the Arctic tundra is starved for airborne moisture; yet water soaks its surface during summer's thaw. Temperature extremes are awesome.

To give members a better understanding of this enigmatic land, National Geographic sent staff scientist Paul A. Zahl to Alaska to explore the living tundra of today. He writes of the ingenious adaptations that plants and animals make to their harsh environment, and



WHERE TREES END, ALPINE TUNDRA BEGINS IN MOUNT McKINLEY NATIONAL PARK; CHARLIE OTT

of the increasing efforts of science to learn about the tundra and how to protect it.

In a companion article paleontologist Russell D. Guthrie describes the tundra's animal life as it existed in the Ice Age. The supplement included with this issue presents a fascinating painting by artist-naturalist Jay H. Matternes that restores flesh and fur to those extraordinary mammals of 12,000 years ago.

As we ponder the tundra—its problems, its promise, and its past—two aims emerge: Get the oil out. Save the wilderness. Perhaps scientists will come up with ideas that can allow both dreams to come true.

On the other side of the supplement appears a new map of Canada, that immense transcontinental confederation bordered by three oceans, which covers more of the globe than any other nation except the Soviet Union. Canada's more than 3.8 million square miles already yield resources enough to make the country an industrial giant. Yet vast unexploited areas promise still greater stores of precious commodities.

Canada has been called a land too huge and diverse to define, ranging as it does from frigid tundra to the mild and pleasant British Columbia coast. Assistant Editor Jules B. Billard writes of that verdant region where Canadians of many races live amid giant trees, green grass, and year-round flowers—far from the Arctic tundra, yet linked inextricably to a distant wilderness and its treasure of oil.—THE EDITOR



Re-creating a Vanished World

By RUSSELL D. GUTHRIE, Ph.D.
DEPARTMENT OF BIOLOGICAL SCIENCES, UNIVERSITY OF ALASKA



Ghostly forms of bygone mammals mingle with surviving species in this portrayal of Alaskan tundra life of more than a hundred centuries ago. Sheltered by mountains from the ice that blanketed so much of the Northern Hemisphere, the grasslands of Alaska's interior formed a natural haven for men and beasts. Then, as the ice sheets ebbed—and, probably, as man became a better hunter—the delicate balance of the refuge was upset. Extinction followed for about a third of the species represented in Jay H. Matternes's remarkable painting, which comes to members with this issue of the magazine. Animals shown in white in the key at left no longer exist; shaded species (or closely related forms) survive, but not in Alaska; the rest still dwell there:

(1) Arctic ground squirrel; (2) caribou; (3) brown lemming; (4) red fox; (5) horse; (6) badger; (7) saiga antelope; (8) Dall sheep; (9) Arctic fox; (10) Alaskan tundra hare; (11) lynx; (12) musk ox; (13) large-horned bison; (14) musk ox; (15) ground sloth; (16) man; (17) lodge housing beaver; (18) moose; (19) woolly mammoth; (20) great North American short-faced bear; (21) wolf; (22) wolverine; (23) grizzly bear; (24) lionlike cat; (25) stag-moose; (26) yak; (27) musk ox; (28) wapiti (American elk); (29) camel; (30) American mastodon; (31) saber-toothed cat.

ELEPHANTS IN ALASKA? As farfetched as it sounds, men lived 12,000 years ago in what is now the northernmost of these United States amid a startling array of wildlife: not only today's familiar foxes and bears, reindeer and lemmings, but also lions, camels, and 12-foot-high mammoths.

In all, 31 species—11 of them now extinct—appear in a unique portrayal of the Alaskan tundra's Ice Age fauna, distributed as a supplement to this issue of NATIONAL GEOGRAPHIC. It was painted by artist-naturalist Jay H. Matternes as a preliminary step in the creation of a 12-by-20-foot mural for the National Museum of Natural History in Washington, D. C., and is reproduced here for the first time with the permission of the museum's parent organization, the Smithsonian Institution.

How did so many creatures of various climes come to be in Alaska? And what did they look like? Answers to such

puzzles emerge from the cooperation of gold seekers and fossil collectors, of geologists and paleontologists; and through the skilled detective work of the artist.

We see the animals in the Alaskan refugium, an ice-free enclave in central Alaska. Most of the species depicted descended from immigrants that crossed to the Western Hemisphere over a land bridge from Asia. That bridge came into being during the glacial epoch, when so much ice piled up over northern lands that the oceans dropped 300 feet below their present levels. A thousand-mile-wide strip lay high and dry. *Homo Sapiens* also crossed that bridge; four of his kind appear as tiny figures in the left background, attacking a *Megalonyx*, a giant ground sloth.

Verdant Haven Lured Giant Grazers

The drama of an Ice Age summer unfolds on grassy tundra, which offered nutritious pasture and sure footing, conditions that favored big grazers: the woolly mammoth, the giant bison, the Arctic horse.

Strong, dry winds kept in motion a far-reaching ecological process, one that stored up the clues that now give scientists a glimpse of that long-lost world. Each summer, moisture-laden soil on the hills would thaw to a depth of a few inches or feet, and—before freezing again—descend the slopes in wave-like lobes, as seen on the hillside at left in the painting and in the aerial photograph on pages 300-301. As they went, these slow-moving masses picked up the remains of plants and animals and eventually carried them down to the valley bottoms. The result was an accumulation there of dark, organic frozen silt, rich in fossils—plant and animal remains remarkably preserved by the cold.

Tons of these relics are now in museums because miners sought out gold deposits in ancient stream beds that underlie the frozen muck. To get at the gold, the miners used hydraulic hoses. Each day they would jet off six inches or so of thawed muck. The muck came off like soft ice cream, and with it came the fossils, including thousands of large mammal bones.

Among the creatures, the most widely represented is the giant bison, followed by the Arctic horse. They add up to more than three-quarters of the mammal fossils recovered. Only one bone out of several hundred comes from *Panthera atrox*, an extinct big cat thought to have looked much like today's African lion. All in all, Alaska's Ice Age fauna resembles that which also occurred at the time across northern Asia and along the southern edge of the European ice sheet—not surprisingly, since the land bridge allowed the animals to migrate freely.

In his patient and highly scientific reconstruction of vanished species, artist Matternes used some skeletons assembled by museum paleontologists, as in the case of the woolly mammoth. Of the extinct camel, however, there were only the limbs. By themselves, these were conclusive evidence of the camel's presence in the refugium; and



20,000 YEARS AGO



12,000 YEARS AGO

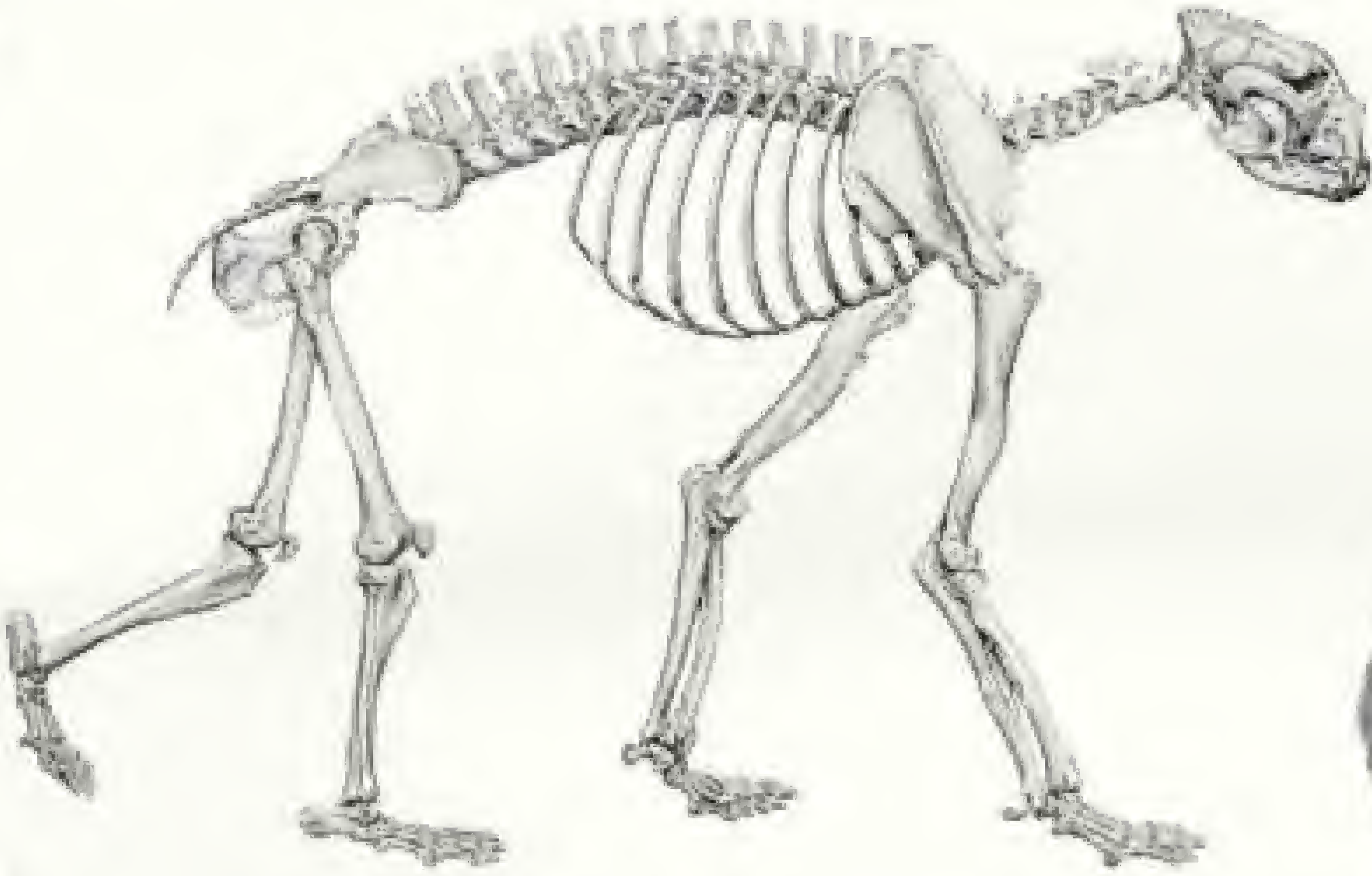


TODAY

Ice Age glaciers trapped so much moisture that the oceans receded. Across a 1,000-mile-wide land bridge (**left**) wandered many species of animals—and man himself. At the time depicted in the supplement painting, melt-fed seas had again risen (**center**).

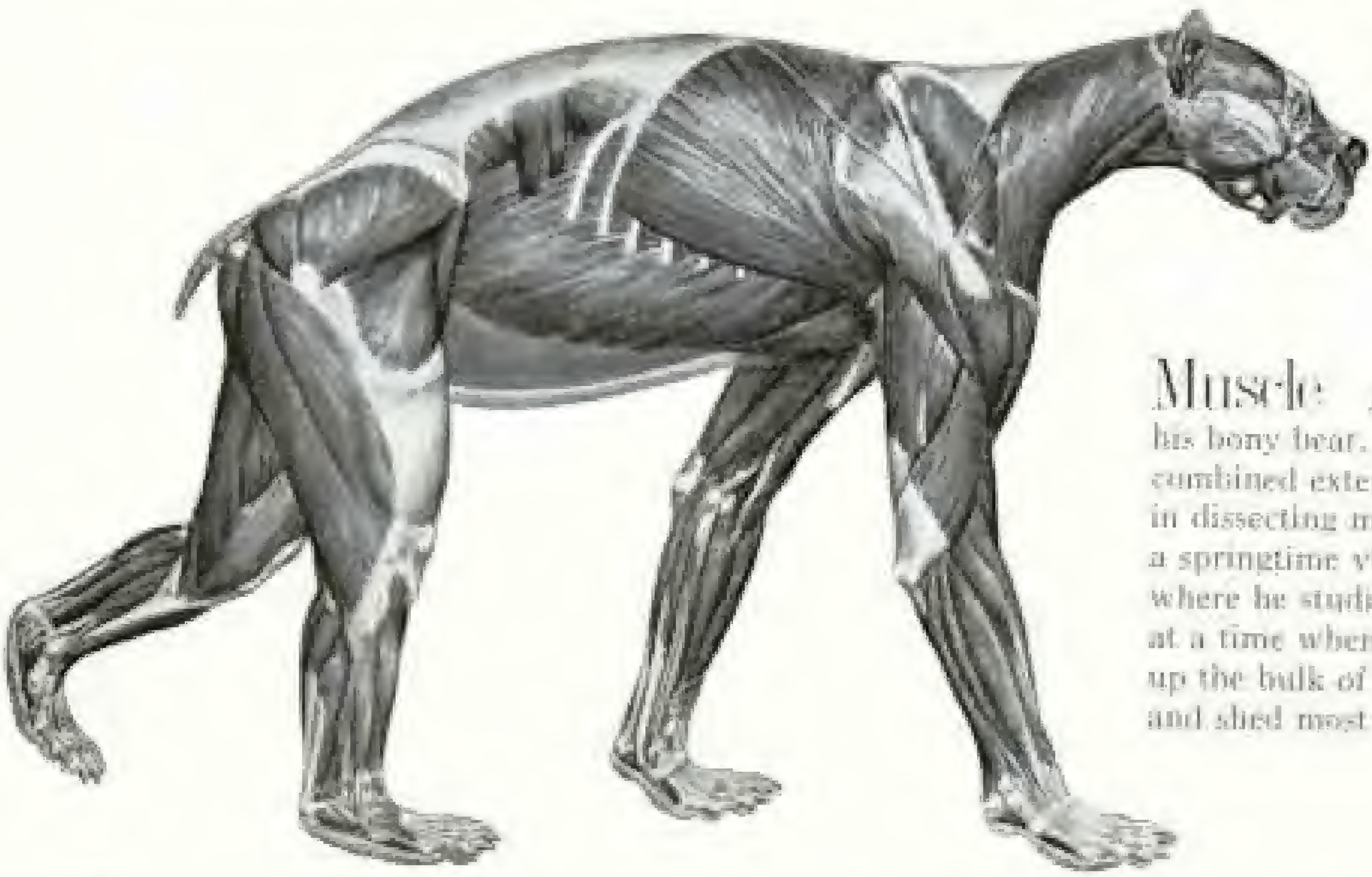
Thirty-one thousand years old, the mineral-stained carcass of an extinct bison undergoes examination by Dr. Clayton Ray at the Smithsonian Institution (**opposite page**). Such Ice Age "mummies," most of which are in the Frick Collection of the American Museum of Natural History, helped make possible the accuracy of the Matternes painting.


Dome Cr.
1001/1951
1001/1951





Skeleton Starting with a few bones from the Field Museum of Natural History in Chicago, Jay Matternes reconstructs the extinct short-faced bear *Arctodus simus.* His raw materials: a skull, a jaw, a shoulder blade, several vertebrae, the leg bones, and part of a foot. As an additional guide the artist brought to his studio a skeleton of *Arctodus*'s closest living relative, the South American spectacled bear. From this he worked out the ratio of length of skull to length of vertebral column, as a basis for computing *Arctodus*'s total length. Deducing the sizes of other bones in similar fashion, he finally sketched a complete skeleton—step one in rebuilding his bear from the inside out.



Muscle Adding flesh to his bony bear, Mr. Matternes combined extensive experience in dissecting mammals with a springtime visit to the zoo, where he studied bears at a time when they had used up the bulk of their fat and shed most of their hair.



The short-faced bear

Fur Full-fledged beast wears a coat of thick fur over a heavy hide and an underlying layer of fat. To portray the proper stance for long-limbed *Arctodus*, Mr. Matternes studied photographs of the closely related raccoon and giant panda. Standing slightly higher than five feet at the shoulder—larger than the Alaskan brown bear of today—the completed Ice Age creature ambles between a herd of bison and a pair of wolves in a section of the supplement painting reproduced at right.





Preserved in nature's deep freeze for 17,000 years, a musk ox survives intact (**above**) except for the horns, probably taken by the miner who found this now-extinct animal, *Bootherium nivicolens*.

After winter frosts heave and buckle the moisture-laden soil, summer thaws soften it. Seen here from a plane, it flows slowly down a foothill of the Alaska Range (**right**). Such movement, known as solifluction (page 307), covered Ice Age plants and animal carcasses with protective silt and slid them into stream valleys to await the hoses of Alaska gold miners (**below**).





since the animal occurred commonly during the Ice Age farther south in the Western Hemisphere and in Eurasia, additional bones were readily available.

It is a long step, however, from an incomplete skeleton to a lifelike representation in full color. An illustration of Mr. Matternes's method of reconstructing a mammal from the inside out, largely on the basis of bones, appears on the preceding pages.

The most striking finds from the Alaskan refugium are not bones, however, but "mummies." Occasionally—say, during a flood in early summer—silt would rapidly cover living plants and insects, or a small mammal, or a piece of a large carcass somehow left uneaten. Tens of thousands of years later a great leg or head would emerge from the frozen soil with hide and soft parts shrunken



JAMES E. RUSSELL (UPPER LEFT), RUSSELL D. GUTHRIE (LOWER LEFT), AND GEORGE HERBEN

but intact. Sometimes there would still be dried blood. And sometimes, through a rare chain of circumstances, an entire large mammal would be preserved (upper left).

To include so many species in his painting, Mr. Matternes had to exaggerate the density of the region's population. Probably not all these species appeared there in any single summer, but discoveries elsewhere in central Alaska prove they existed at the same time. Altogether, the painting reflects the best of our knowledge of life on the Ice Age tundra.

Greatest Prize Still Eludes Searchers

But who can say what surprises may still be in store for us?

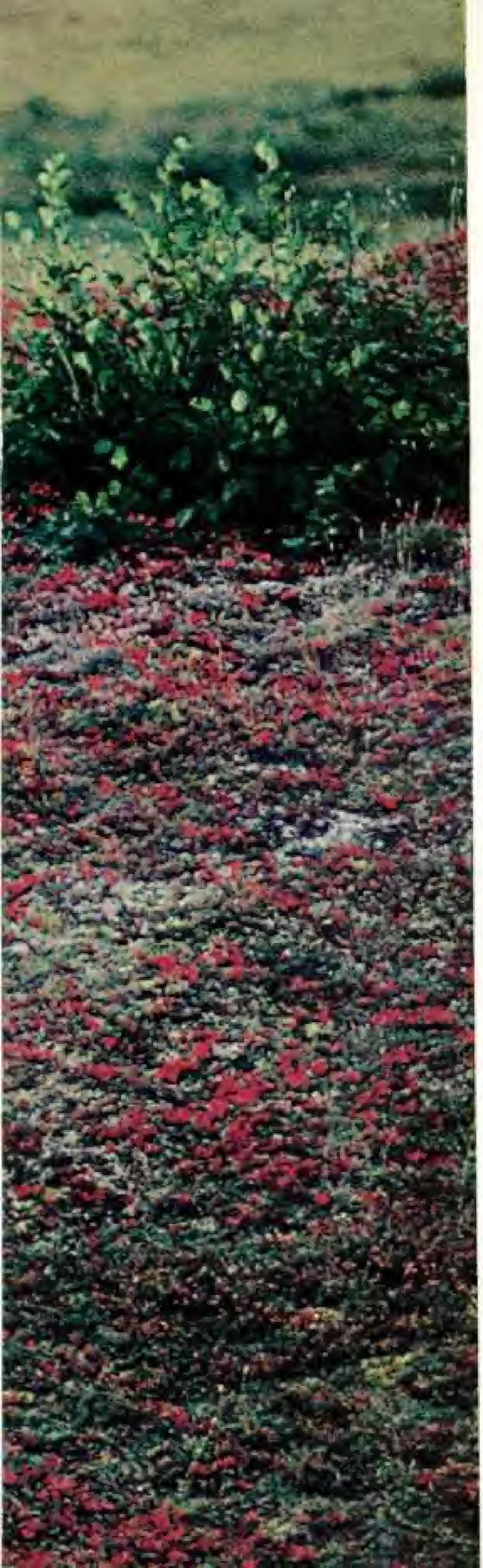
The biggest surprise might well involve *Homo sapiens* himself. Neither hair nor bone of him has yet been found in the muck. So far his presence has been deduced only from artifacts, such as stones shaped and pointed as weapons.

Hydraulic gold mining has dwindled and is thus unlikely to provide startling new discoveries. But recent surveying for the route of the proposed trans-Alaska oil pipeline has turned up numerous sites of human habitation. Some of them are thought to be 13,000 years old or older.

Most have as yet yielded only hunting implements, and are presumed by archeologists to have been no more than the temporary camps of nomadic hunters. But two sites of later date reflect more permanent occupation and contain women's things as well—skin scrapers and thimbles.

Human bones may turn up one day. Perhaps even a whole Ice Age man! □





Portrait of a Fierce and Fragile Land

By PAUL A. ZAHL, Ph.D.
NATIONAL GEOGRAPHIC SENIOR SCIENTIST

THE TUNDRA. It curves like an irregular beltway around the Arctic, fringing northern Alaska and Canada. It cuts across Greenland into European Russia and Siberia (map, pages 306-307). Harsh, treeless, sparsely peopled, it covers some three million square miles—roughly a twentieth of the planet's land surface.

In the winter a cold, pale, distant sun appears only briefly on the southern horizon. Nose-diving temperatures sometimes approach minus 70° F. Summer temperatures in the tundra reach into the 70's and 80's, so the yearly range can be awesome.

Life on the tundra finds that nature sets harsh terms—among them, a scarcity of life-giving precipitation. The region receives little more than some desert areas. Yet on the surface of this far-northern land lie immense quantities of water locked in ice for much of the year. And beneath the surface is a layer

Poised for flight, a bull caribou sizes up an intruder. Leaves of alpine bearberry crimson the tundra in Mount McKinley National Park during summer's brief but spectacular "season of life." Conservationists and oilmen seek ways to ensure that pipelines in Alaska will not disrupt migrations of caribou, which move in herds that sometimes total many thousands.

TED BELL

of ground called permafrost, whose temperature always remains below 32° F. An obstacle to absorption, the zone measures 2,000 feet thick in parts of Alaska's North Slope and almost a mile deep in Siberia.

For three-fourths of the year, the tundra is a frigid, hostile, seemingly lifeless realm. But in June a miracle begins.

A never-setting summer sun brings forth plant species by the hundreds. Flowers appear—delicate, and often astonishingly colorful. Swans, ducks, and geese from the south splash down on pristine lakes. They mate and nest and head south again before autumn puts a slick of ice on every pond.

The angry whine of mosquitoes mingles with a low-keyed hum of other insects. Herds of caribou cast long, stalking shadows as they wander across a sun-skirted horizon in search of favorite victuals. Lemmings scurry over the tundra and marshland as they seek food and try to avoid predators. Foxes, wolves, owls, and predatory jaegers make life for other animals a hazardous adventure.

The cackling of ptarmigans adds a sound of urgency to this briefly burgeoning world. Moose and grizzlies, some of them with their young, wander along wooded streams and mountain valleys.

Summer simply erupts in tundra country. It is a time for life; in this startlingly finite season, reproduction must counter winter's violence and death to keep nature in precarious balance.

Then, as the first mantle of snow arrives, the smaller animals begin to disappear, burrowing under the white surface in quest of enough shelter and food to endure the long winter. Some, like the ground squirrel, hibernate; others, like the lemming, remain active in their snowy tunnels. Insect eggs, larvae, and pupae lie hidden in the soil. Nimble year-rounders like the Arctic fox and ptarmigan change coats to match winter's whiteness (page 312). Thus they adapt to survive in a realm that has again become grim, treacherous, deepfrozen.

FOR CENTURIES the changing seasons of the tundra went unseen, except by Eskimos and an occasional explorer—for what could draw man to a land as alien as this?

What indeed? Petroleum prospectors discovered in 1968 that the oil reserves under the permafrost on Alaska's North Slope were immense. They flew in to find ways to get the oil out. Their proposal: an 800-mile pipeline to convey the oil, hot from the earth's depths, to an ice-free seaport far to the south.*

Rugged as this land seemed, it was extremely fragile, and pipeline proponents had to take that aspect into account. Drive a bulldozer across the springy summer turf, and the tracks might remain for years. What would a hot pipeline do?

To find the answer, another type of "prospector" headed north—the natural scientist. Entomologists, botanists, mammalogists, permafrost experts—they probed for facts to show how to protect the delicate tundra.

Now I was on my way north to observe the results of their studies and to see for myself the miracle of Arctic summer. As a biologist I have long been fascinated by the adaptation of living things to hostile environments, and there are few environments as hostile as the tundra.

> "I seemed to sense, in these bravely aspiring bits of life, the plea for just a little more sun"

An hour before, my jet airliner had cleared the traffic pattern at Fairbanks, Alaska, and crossed the Arctic Circle. The tortuous Yukon River had come and gone, then the forbidding, cloud-shrouded Brooks Range. For many minutes those vast Arctic plains called tundra slid unchangingly under the wings; then the plane began its descent to Deadhorse.

As the plane banked downward, I pressed my face against the cool plastic window and studied the awesome expanse below. The terrain was marked with strange patterns suggesting cross sections of a giant beehive (pages 310-11). Innumerable mirrorlike ovals of standing water dotted the landscape.

The notorious Alaskan mosquitoes greeted me when I stepped off the plane at Deadhorse. So did a British Petroleum Company truck, whose driver took me to the company's

*William S. Ellis reported on the pipeline last October in a NATIONAL GEOGRAPHIC article, "Will Oil and Tundra Mix?"

field station a few miles away. There I met ecologists and environmentalists whose studies, sponsored primarily by the U. S. National Science Foundation as part of IBP, the International Biological Program, aim at a new understanding of the tundra—the functioning and interaction of its soil, water, and climate, its marvelous plants, mammals, birds, insects, and microbes.

Dr. Jerry Brown, the director of IBP's Tundra Biome Program, was on an inspection visit to Deadhorse when I arrived.

"We're students of this northern ecosystem, and the tundra is our outdoor laboratory," Jerry commented next day as we jeeped over a gravel road into the flat immensity of the Arctic never-never land.

Oil had built the road we traveled, and Jerry pointed to the horizon where drilling rigs stood like toy towers. "They connect with a vast deposit nearly two miles down," he said. "But it's the surface world that interests us as ecologists."

Our truck pulled up at a roadside parking spot, and we walked to the top of a pingo that jutted like a tiny mountain 30 feet above the plain. These pingos form when permafrost surrounds water-saturated soil beneath a silt-filled lake. Gradually freezing, the water cannot expand sideways or downward, and so it pushes upward, creating a mound with a thin overlay of soil and vegetation (pages 306 and 308-9).

Jerry's companions began testing and adjusting automatic meteorological instruments installed on the pingo.

"This is good country for studying nature in most of her extremes," Jerry told me. "Our instruments measure precipitation and evaporation, humidity and wind velocity—in fact, almost every physical variable."

Winter temperatures in the tundra are low enough to deepfreeze insect larvae and plants. Physiologists once assumed that such freezing would cause fluid in cells to crystallize, fatally damaging the microstructure of protoplasm. But all around me was evidence that life does indeed exist from year to year. Insects and plants in the tundra have developed chemical resistances—built-in "antifreezes"—as well as physical means of withstanding these very low temperatures.

I wandered down off the pingo, lured by splashes of color on the flats, to wade through fields of flowers—perky little blossoms that spend their short, unheeded lives under persistent, near-horizontal sunlight.

There were familiar varieties—poppies, buttercups, tussock sedges—and scores of others quite new to me, poking through a cover of prostrate shrubs. Belly plants, one botanist called them. Back home, I'd call them trees—birch and willow—but here, struggling in a shallow acid soil and exposed to extreme temperatures and strong winds, they grow only knee-high.

On the tundra the time for flowering is frantically brief. I could almost feel in the air the harsh dictates of nature. I seemed to sense, in these bravely aspiring bits of life, the plea for just a little more sun, just a little more time to store away starches and proteins, to fortify the next generation for its winter ordeal.

THE GROUND FELT YIELDING and springy as I walked. The surface was soft, in places mushy and mattressed with mosses. The living carpet included lichens, those strange members of the plant kingdom, two disparate botanic groups, algae and fungi, that mesh as one. Botanists believe that, in this curious union, the fungus provides structural support and possibly essential minerals, while the alga photosynthesizes busily to produce needed nutrients.

The lichens are vitally important in the area's biological economy, for they supply the fodder upon which so many Arctic herbivores depend. For millenniums they have been a winter staple for millions of caribou in Alaska and Canada, and their reindeer relatives in Europe and Asia.

A favorite kind is *Cladonia*, one of several lichens called reindeer moss (pages 320-21). I pulled up a handful; it had the feel and texture of a plastic kitchen sponge. Curious to discover what a caribou snack tasted like, I nibbled a bit of it. Like a plastic kitchen sponge!

Less than a yard beneath my waterproof boots lay permafrost, that unyielding, perennially frozen layer of earth. It blocks penetration by water, and there is little runoff because of the flatness of the terrain. Hence those thousands upon thousands of brooding, sky-reflecting water mirrors, and the mushiness underfoot (painting, next pages).

It's difficult to realize how structurally fragile the impervious-looking tundra really is. So delicately balanced a relationship exists between the tundra plants and the soil beneath them that compressions of any sort, even footpaths, may leave long-lasting scars. Whenever I took a walk on the tundra, each

step seemed to demand a decision. Where would my boot do the least damage?

Alaska state regulations require that vehicles stay off the tundra during summer's thaw, except for emergencies and scientific projects. Otherwise, ground transport is undertaken only in winter, when the surface is frozen. Meanwhile, researchers conduct tests on shrubs and grasses from all over the Arctic world to determine which would be helpful if tundra reseeding proves practical.

Other researchers investigate the strange ways evolved by tundra insects to assure the survival of their kind.

"Here's one that has developed an astonishing way to get its young through the first harsh winter," entomologist Mark Deyrup told me one day. He pointed to a pinned specimen he'd taken. "It's a warble fly, a fuzzy relative of the common housefly. It affixes its eggs to a caribou's abdominal hairs in the fall. The hatching larvae burrow into the skin and work their way into the back tissues. All through the winter, the larvae have a warm home inside the animal. By the time they work their way out through the skin, another tundra summer will have begun."

Insects, food supply, weather, terrain, and the mating urge figure in the complex migration cycles of caribou, a subject only vaguely understood. Alaska's two northern herds, whose estimated 440,000 animals constitute two-thirds of the caribou in the state, move between the south side of the Brooks Range and the North Slope in a generally north-south pattern. Pregnant cows go north in the spring to bear their calves on the tundra (pages 336-7), and the bulls follow. By fall the herds are back on the wooded south slopes of the Brooks Range for mating, and they remain all winter.

But what would happen if massive herds met an oil pipeline on their northward journey? Would it divert them?

Near Prudhoe Bay the oil industry built a two-mile stretch of four-foot fence to simulate a pipeline. At intervals ramps of earth allowed passage over the barrier. Some sections were on a trestle, allowing passage below.

Last summer about 1,000 animals confronted the fence as they ambled in search of better grazing. Few went over or under it; those that did not retreat moved parallel to the fence until they could skirt one end—hinting that an above-ground pipeline may in fact prove a serious barrier to migration.

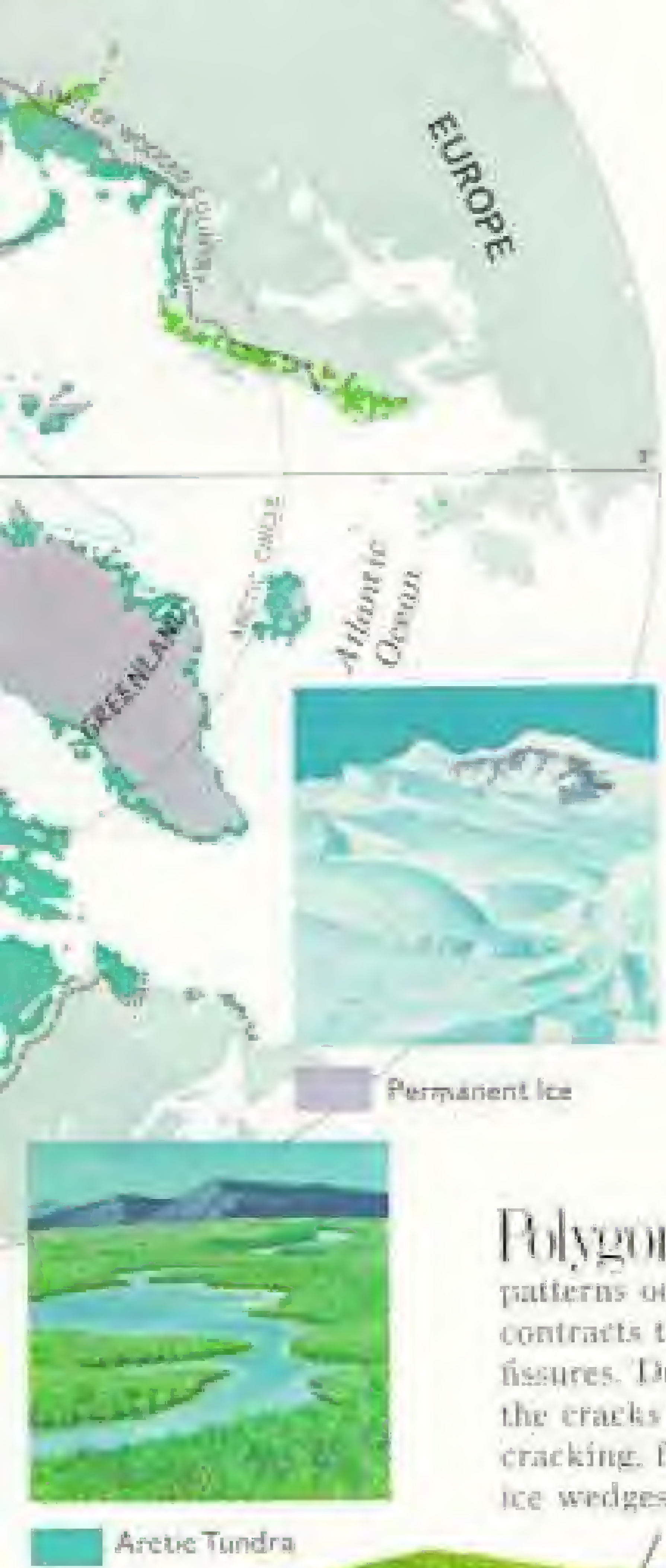
(Continued on page 313)





Oriented lakes by the thousands lie on a common northwest-southeast axis, a phenomenon that intrigues scientists. Among possible causes under study are prevailing winds, which here blow from the northeast, at right angles to the lakes.

Pingos As a tundra lake fills with silt, permafrost encroaches from the sides. At last sediments at the center become frozen; unable to expand sideways, excess water bulges upward as it freezes, forming an ice-cored mound, or pingo.



What is tundra?

LIKE A FRAYED and frozen collar atop the northland's forest wrap, tundra rings the Arctic Ocean (**left**). Under the name alpine tundra, similar hardy vegetation leapfrogs far southward on the frigid heights of mountains.

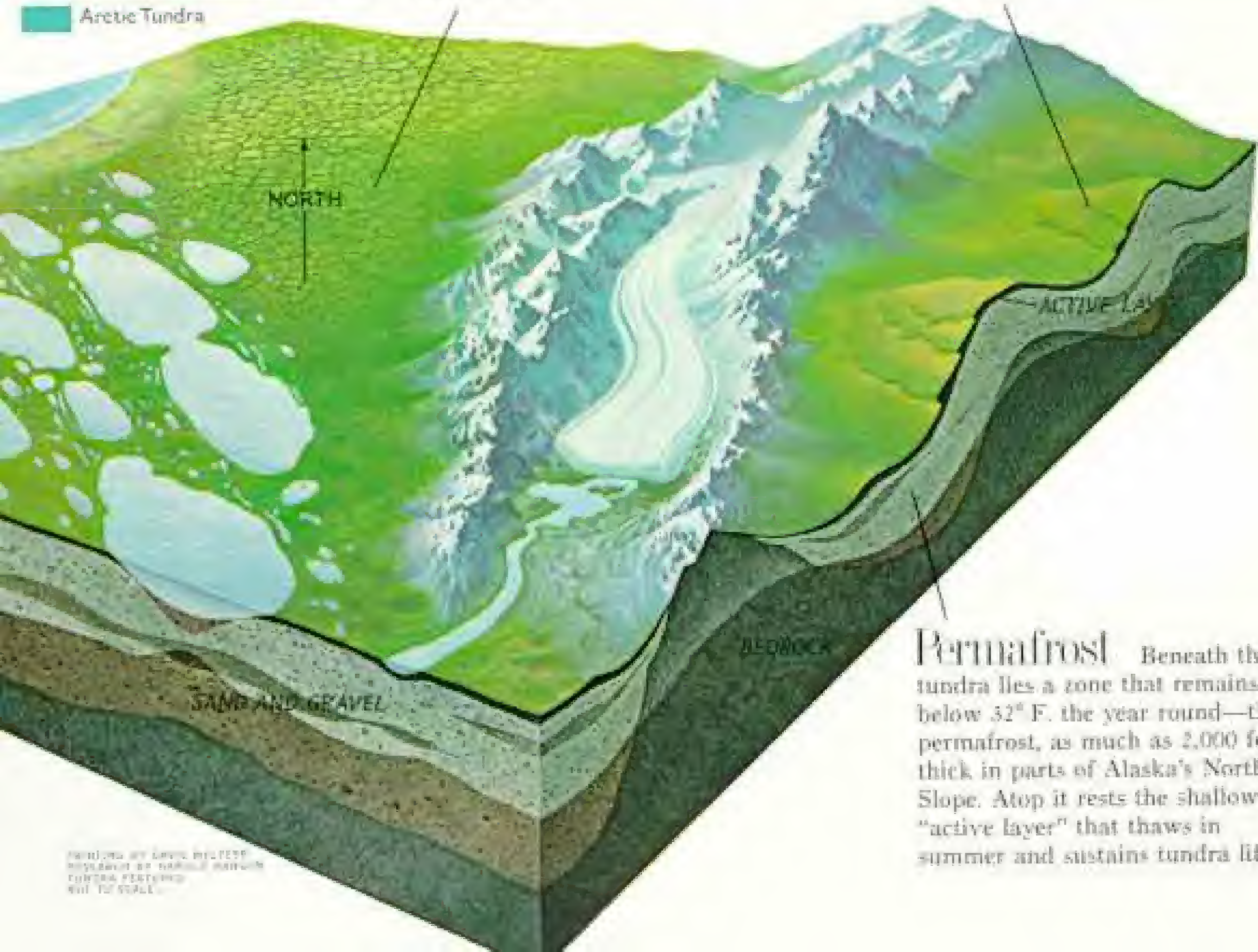
A land of paradoxes, the Arctic tundra has been likened to desert in amount of precipitation, yet water soaks large areas of its surface. Permafrost forms a seal that blocks absorption, and flatness bars runoff.

Despite its apparent sameness, the tundra contains varied worlds, depending upon surface moisture, temperature, and winds—near-desolate areas of lichens and lemmings; more favored zones of cranberries and dwarf willows; and relatively hospitable expanses of grasses and sedges with willow thickets tall enough to hide a moose.

Just as the Eskimo of the tundra traditionally avoided the forest, so the tree line defines the range of most tundra creatures. Only a handful of animals, such as the caribou and the red fox, are equally at home in the forest and on the plain.

Polygons Strangely uniform patterns occur when intense cold contracts the ground, opening fissures. During spring, water enters the cracks and freezes. Repeated cracking, filling, and freezing causes ice wedges to form.

Solifluction Permafrost prevents absorption of surface water, so the topsoil remains saturated. During summer thaws the soil may flow slowly downhill in a movement known as solifluction.



Permafrost Beneath the tundra lies a zone that remains below 32° F. the year round—the permafrost, as much as 2,000 feet thick in parts of Alaska's North Slope. Atop it rests the shallow "active layer" that thaws in summer and sustains tundra life.



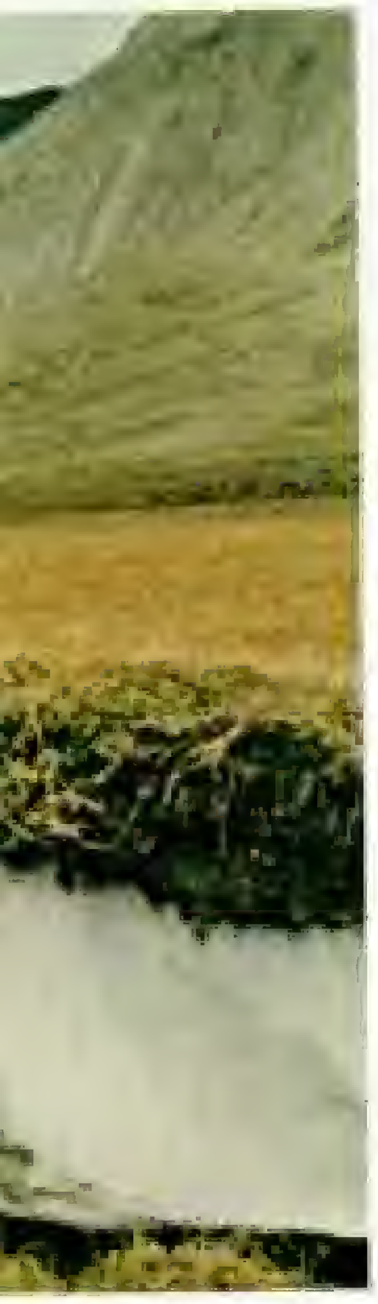
ELIE L. MICHEY



BRYAN L. SAGE (ABOVE); CHARLES G. MULL









Six inches to winter: Exploring an Eskimo village site near Galbraith Lake (**right**), archeologist Charles Diters can probe only half a foot down—the extent of summer's thawing above the permafrost. Ever-frozen depths, miry surfaces, and hard-biting mosquitoes (note netting and gloves) make his job difficult. But from the tundra he may unearth artifacts of America's first men, the bold hunters who crossed the land bridge from Asia (map, page 296).



Ice-filled blister, a pingo (**upper left**) protrudes from the floor of a lake near Prudhoe Bay that silted up hundreds, perhaps thousands, of years ago (painting, preceding page). Pingos attain heights of more than a hundred feet. Eventually a pingo's summit may rupture and thaw, creating a water-filled crater or collapsing the hillock altogether.

Nature's layer cake, a slab of ground ice (**left, center**) lies exposed near the Atigun River. The ice, probably left over from an ancient river, became covered with an insulating layer of soil and vegetation that permitted it to survive summer thaws.

Wedges of ice stab permafrost on an eroded bank of the Shaviovik River (**lower left**). Forming in cracks and growing slowly, the wedges help create the polygons characteristic of the tundra's "patterned ground."

Scourge of the north, an Alaskan mosquito, *Aedes nigripes* (**right**), ends its career as a museum specimen after being plucked from the author's coat.



PAUL A. ZAHL



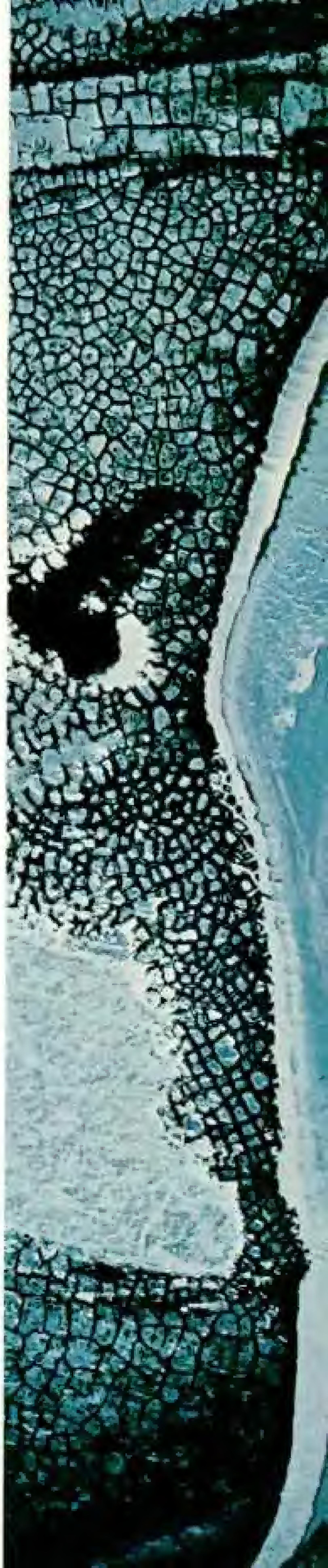
STEVEN C. WILSON (ABOVE AND BELOW); NASA (RIGHT)



Dragon scales of frozen earth, polygons flank the Colville River, largest stream on the North Slope. A NASA aircraft made this infrared photograph from 5,000 feet. The geometric fractures, from 10 to more than 100 feet across, cover hundreds of square miles of tundra.

Lumpy landscape: Tussocks of sedge (**left**) march to the horizon. Some sedges and grasses accentuate a natural tendency to grow in clumps. Birds and small landbound creatures find food and shelter in such ground cover; man finds walking across it difficult.

Bubbles trapped in ice seven feet thick reveal the clarity of a pristine lake near Anaktuvuk Pass. The air pockets, some of them eight inches in diameter, were formed when aquatic plants released gases that became locked at various levels as winter froze the lake to increasing depths.









At home in a hostile world, an Arctic fox wears winter's protective white; in summer he is brown. Small ears lose less body heat than those of long-eared foxes of warmer climes.

Groggily shielding her cub, a drugged polar bear awaits tagging by scientists off Barrow, Alaska. Primarily sea feeders, the animals occasionally invade the tundra for a meal.



From Prudhoe Bay I journeyed to Barrow, an area where Eskimos still hunt seal and walrus in icy waters, to visit the U. S. Navy's well-equipped Arctic Research Laboratory. Several studies of the tundra are under way there, including an intensive program to find out more about that furry, fist-size grazer, the lemming (page 331).

Investigators are interested in lemmings' seasonal movements, of course, but of even greater interest are the little creatures' population explosions that occur every three or four years. Lemmings—both the brown and the collared species—are among the most prolific of mammals.

In many ways, life on the tundra is geared to the population cycles of lemmings. When lemmings become abundant, the numbers of owls, foxes, and weasels start to soar, for the small rodents are staples of carnivore diets.

The lemmings nibble away much of the tundra's plant life during a peak population year. Winter's snows do not save the plants, for the animals burrow under the white mantle and eat just about everything that is vegetable, except for a few mosses and lichens. They may strip limited areas so thoroughly that the next summer's melt-off will bare the soil to deeper thawing and possible erosion. Such stripped areas will then feed fewer animals.

When lemming numbers outrun the food supply, their populations dwindle. Hungry predators hunt them more fiercely, causing further inroads, or turn instead to other sources of food, such as nesting birds; and bird numbers decline—further extending the chain effect of lemming population cycles.

At an "intensive study site" of the Tundra Biome Program near the Navy's lab at Barrow, I examined an elaborate series of live-catch traps, designed to assay lemming density. Lemming population was on the rise

that summer of 1971, and this year may see an even bigger crop.

While hiking on the tundra between the various experimental stakeouts, I was forced to jump across shallow gullies in the sloshy terrain—segments of those weirdly shaped polygons I'd seen earlier from the air. Some of the polygons measured only a few feet across; others spanned a hundred feet or more. Viewed from the ground, their beautiful geometry was lost.

From Fairbanks to Barrow, I found Arctic environmentalists worried about the possibility of oil spills on the tundra. What weapons could be used to fight such damage?

Possibly some very small weapons—microbes. Scientists know that certain one-celled organisms can "biodegrade" oil—that is, break it down into chemical compounds that are no longer harmful. If their effectiveness could be increased with nutrients that would help them multiply, perhaps they could render inactive the petroleum hydrocarbons and mitigate the effects of a spill.

That type of experimentation is going on at Barrow. Small, controlled "spills" are being tried on tundra and in ponds. It is a highly sophisticated exercise in biochemistry, though. In order to see how nature makes repairs, natural oil seeps in the Barrow area are also being studied.

TOWARD THE END of August, with the air already picking up a touch of early autumn, I left Fairbanks on the last leg of my Alaska odyssey. In a rented car I loafed southward along the splendid Richardson and Glenn Highways. Fading lupines and fireweed gone to seed lined my hard-surfaced path. Overhead, wedges of calling geese moved south.

The road wound up through Isabel Pass between sky-piercing peaks, whose snow mantles were already invading the lower slopes. I looked up past timberline, where autumn's tundra glowed—not with the splashy yellows and oranges of a New England fall, but in soft, somber hues—dull reds, subdued browns.

Surely there was time for one more stroll. I pulled off the road and left the car. Skirting a still, blue-black pond, I felt eyes on me. They belonged to a moose, belly deep in the water. Concerned with my approach, but hardly alarmed, she took a long look, then dipped her great ungainly muzzle into the shallows for another dripping mouthful of water plants. Except for the male during rutting season, and the female with young, the Alaska moose is not a particularly aggressive animal, and this lady seemed not at all unfriendly.

I moved on, climbing a resilient carpet of lichens and moss toward the higher alpine tundra. The shrubbery that tugged at my khakis sagged with ripening berries—autumn

"They say there is an urgent need for oil. But there's an urgent need to protect the tundra, too"

food for grizzlies (pages 332-3). Well, if a grizzly should wander by, I could take comfort in the knowledge that he'd prefer to munch on those berries instead of on me.

My car was now a mere dot down on the highway, for I'd climbed upward some 500 feet. I picked a convenient rock, suitably upholstered with lichens, and sat down.

The mountain view was fabulous. What a contrast, I mused, to the melancholy flatlands five hundred miles to the north.

Lifting the binoculars from my chest, I focused on the pond below. Now it was deserted; the moose had finished her lunch and ambled away.

Soon that pond would be ice-covered. The moose would seek sheltering clumps of willow. Ground squirrels would go into their burrows; how many, I wondered, would be flushed out next year by bulldozers?

While the North Slope oil controversy swirls back home, those scores of persistent scientists continue probing the tundra's ecosystem. All their bits and pieces of information will be fitted together to give us a clearer picture of how the tundra works. Perhaps then we'll find a solution that can satisfy oilmen and environmentalists alike.

They say there is an urgent need for the oil that lies beneath the slope. But there's an urgent need to protect the tundra, too—that immensely desolate, immensely beautiful, immensely fragile land. □

ELIE E. ROGERS (BELOW); FOLLOWING PAGES, RHODODENDRON LAPPONICUM, PAUL A. ZAHL



PLANTS

OF THE ALASKAN TUNDRA

THE PRODIGAL SUN, having forsaken the tundra through much of the year, returns in spring and atones for its neglect with 24 hours a day of life-giving light. Even as the snow melts, tiny blooms wink with color on a landscape still locked in an icy monochrome. A five-minute stroll on the northern slope of the Brooks Range yielded the nosegay above.

Many tundra miniatures are kin to larger species of kindlier climes. The four-inch-high Lapland rosebay (*following pages*), a dwarf rhododendron, has relatives towering 25 feet or more in woodlands of the Eastern States.









SALIX LANATA, PAUL A. ZAHL; EPILOBIUM ANGUSTIFOLIUM (LEFT), CHARLIE OTT



ACONITUM DELPHINIIFOLIUM, PAUL A. ZAHL



CORNUS CANADENSIS (ABOVE) AND VACCINIUM VITIS-IDAEA, BOTH BY CHARLIE OTT



BENEATH AUGUST CLOUDS already hinting darkly of winter (**left**), the late-summer landscape flaunts bright spires of fireweed, a plant that thrives in mountain meadows and on the tundra's fringes. In the brief growing season—June through August—tundra plants bloom and go to seed with dramatic speed. Highly specialized roots must spread horizontally in thawed soil that may be only inches deep—a zone called the "active layer."

Among the plants parading their colors during the fleeting summer are a dwarf willow with flower-laden catkins (**above**); a purple-majestied monkshood (**upper right**), a member of the buttercup family; a dwarf dogwood, or bunchberry (**right, center**), which stands only inches tall in alpine glades and along tundra borders; and the mountain cranberry (**lower right**), whose iced fruits provide snacks for birds and bears.







NATURE'S PLAYFUL MIMICRY: Startling similarity to the antlers of a caribou stag (**top**) explains the name of the caribou-antler lichen (**above**).

Primitive rootless plants with a dual personality, lichens are a composite of mutually supporting algae and fungi. One of the hardiest forms of life, they anchor on wood or stone as well as in soil, and thrive in tropics, deserts, and polar regions.

Botanists study their role in harsh environments as pioneer life forms, the suppliers of organic nourishment for other vegetation.

Surviving where flowering plants cannot, lichens invade the northern tundra and mountain heights to the line of perpetual ice. Delicate in appearance but leathery to the touch, they have tough layers that prevent precious moisture from evaporating.

A rich tapestry of tiny lichens



WILLIAM [illegible] (UPPER LEFT), PAUL [illegible] (LOWER LEFT AND BELOW), CHARLES OTT

(upper right), chiefly trumpet-cupped *Cladonia*, brightens a patch of tundra at the height of summer. Such heavy mats hold the soil and shelter the nests and runways of small mammals.

Matching the yellow of a daisylike bloom, a diminutive butterfly adds to summer's fragile and fleeting beauty; *Boloria selene*'s wings would barely cover a half dollar when fully spread. □



BIRDS
OF THE ALASKAN TUNDRA

FROM MARYLAND, Texas, and California they come . . . from South America, Asia, the Caribbean, and the South Pacific. Great sky-clouding flocks of land birds and waterfowl migrate in the vanguard of spring to ancestral breeding grounds.

Early arrivals like the Lapland longspur (*right*) often find the tundra ice-sheathed and still awesomely inhospitable. But scant snowfall usually allows persistent beaks to peck through to the life-sustaining remains of last year's vegetation.

As the land renews itself beneath the unsleeping sun, feathered visitors incubate their eggs on rocky ledges and in lichen-pillowed hollows—each species finding its ecological niche. Occasionally, an Arctic fox may make off with eggs or fledglings, which are difficult to conceal in a treeless land.

Of the numerous species that nest in the tundra, only a few—such as the snowy owl (*following pages*) and the raven—usually remain the year round. Most begin their long journey southward at the fast-approaching end of summer, filling skies along their route with varied calls, from the longspur's melodious note to the bugle of the crane.



Dark against melting snow, a longspur wears



CALCARIUS LAPPONICUS ALASCENSIS, JOHN J. BURNS

plumage that will blend with vegetation after the spring thaw.



Alert for a scurrying lemming or other favored prey, a snowy owl surveys its realm beside



the Arctic Ocean. It nests atop a grassy knoll—driest vantage point in the soggy tundra.



SHATTERING THE SUMMER CALM with angry cries, a long-tailed jaeger (**left**) tries to frighten away a visitor who has approached its nest, hidden in a depression on the tundra. With the same audacity, these feathered pirates rob the nests of other birds, or even swoop down to seize lemmings. The strong-winged predators winter as far away as the tip of South America. Long central tail plumes distinguish this species from other jaegers, and from their relatives, the gulls and terns.



ASIO FLAMMEUS FLAMMEUS (ABOVE), JOHN J. BURNS; STERCORARIUS LONGICAUDUS (OPPOSITE), G. C. KELLEY



BRANTA CANADENSIS (ABOVE), LENDELL H. PRICE; GAVIA IMMER (LOWER LEFT), GLEN F. CASTLETON



RODENT HUNTER IN THE MAKING, a baby short-eared owl (**top**) shivers in its gauzy coat of natal down. Unlike its larger snowy cousin, it will quit the tundra for warmer climes before winter's onset.

Quartet of Canada goslings (**above center**) paddle in an Arctic stream. Most of those breeding in these far northern regions are of a small subspecies, often no larger than a duck.

Awkward on land, a common loon (**left**) warily guards its eggs. In water, it may dive to great depths in search of fish, on which it feeds almost exclusively. □



Snow-catching antlers of an Alaskan bull moose, world's largest deer,



ALCES ALCES, JOHN S. CRAWFORD

will be shed in winter and regrown in spring.

MAMMALS

OF THE ALASKAN TUNDRA

IN EARLY WINTER'S TWILIGHT, ghostly traceries of cloven feet vein the snow: moose tracks. They wind along the twisting bottomland of a river valley, where clumps of stunted willows and birches blunt the wind and offer twigs for browsing.

Survival through the Arctic's punishing winters is an ever-recurring challenge for tundra mammals. They meet the test in a variety of ways—the moose in the gentler world of the stream course, the Arctic fox by growing a thick white coat, the Arctic ground squirrel by hibernating, the lemming by burrowing under the snow for forage. Furred foot soles and small ears and tails minimize heat loss in some species; thick layers of fat insulate against cold and provide energy in the long, lean winter.

Summer brings striking changes: shorter, sparser coats, darker coloration, seemingly frenzied drives to feed, grow, mate, give birth, put on a reserve of fat against the next winter's rigors.

Into this struggling realm steps man, coveting the tundra's mineral treasure and, in his haste, threatening to upset nature's precarious balance.





SKY-MEADOW TRIUMVIRATE. Dall sheep **(left)** rove the Brooks Range, grazing to the uppermost limits of plant growth. Valley walls at times resound with the crack of horn hitting horn as rams fight for dominance during the rutting season.

WHISKERS TWITCHING, brown lemmings emerge from a burrow in melting snow to greet the spring **(below)**. Legends of lemming mass suicides probably derive from a Scandinavian species that sometimes drowns by the thousands while trying to migrate across open water.



OVIS DALLI (OPPOSITE), WILLIAM STRIBLING; LEMMUS TRIMUCRONATUS (ABOVE), JAMES H. WOLFE...

THE NORTHLAND'S "HORRIBLE BEAR" casts a baleful stare worthy of its name **(following pages)**. But the dining habits of *Ursus arctos horribilis*—the grizzly—hardly merit such a label; it eats quantities of berries, bark, bulbs, and grass, and prefers to feed on animals found dead rather than make its own kills. Occasionally it stalks a young moose or straggling caribou.

Denning up in winter, the grizzly may rouse during mild spells and amble onto the snow for a midnight snack. A relative, the polar bear, occasionally roves the tundra's seaside fringes. OVERLEAF: RICHARD W. MONTAGUE











VULPES VULPES ALASCENSIS (ABOVE), CANIS LUPUS (LEFT), BOTH BY BRYAN L. SAGE

HEADING HOME WITH LUNCH, an Alaskan red fox (**above**) carries a young ground squirrel to its litter of kits. Unlike the Arctic fox (page 317), the red keeps a dark coat the year round. Usually rust-hued, the fur may also be black or an intermediate hue. Like the Arctic fox, the red ranges the tundra all year.

AMONG THE FIERCEST OF PREDATORS, a gray wolf (**left**) lopes in pursuit of a meal. During bumper years for lemmings, wolves find the summer tundra a banquet table of birds and small mammals, eggs and carrion. In winter the canines run in packs and systematically harass herds of caribou, cutting out stragglers—calves, the sick, and the aged.



R. C. KELLEY (ABOVE), STEVE AND DOLORES MCCUTCHEON



QUICK-CHANGE ARTIST, the varying hare each year doffs its lightweight coat of summer brown for fluffy winter white (**above**). Prey of hawks and owls, *Lepus americanus* rarely leaves the protection of timber or brush. Exceptionally large, well-cushioned feet give the creature its alternate name, snowshoe hare.



IN AN ICY WORLD UNTOUCHED BY MAN, *a herd of female caribou winds toward North Slope calving grounds. The bulls will follow later.* □





Canada's Window on the Pacific:

By JULES B. BILLARD
ASSISTANT EDITOR

Photographs by TED SPIEGEL
RAPHO GUILLUMETTE

Trailing swirls of snow, skiers flash down Grouse Mountain. Below lie Vancouver and the Strait of Georgia, a sparkling gateway to the Pacific. On most winter days Vancouverites can ski in the morning, then turn to afternoon golf, sailing, or fishing.



The British Columbia Coast

FOR SIX DAYS it had rained. Not the drenching kind but an insistent drizzle from a blanket of gray whose nap nuzzled Vancouver's building tops. Once wet snow fell—"quite unusual," acquaintances assured me, for mid-February in this busy hub of British Columbia. By day's end the snow trickled away before temperatures in the 40's—"quite usual" for midwinter here, my friends insisted.

The dreariness weighed on me. So did the tired gags Vancouverites repeated whenever

I remarked about the weather. "Every hour 20,000 umbrellas change classes at the University of British Columbia," they told me. "Ten years here and you get webbed feet."

"We like the rain," they also said. "It makes the green grass greener and the big trees bigger." I had to admit that the lush emerald of the lawns had surprised me on my arrival; swelling rhododendron buds and bulbs popping from the ground had seemed incongruous, considering the date on the calendar. I knew, too, that the great evergreens of British Columbia's forests make up 50 percent of all Canada's timber—equal to that of the 14 westernmost United States combined. Ample rain nurtures them; I had read the figure—an average of 960 billion gallons falls on B.C. every day.

But six solid days of depressing drizzle!

"That's nothing," my hotel doorman laughed at my complaint. "Once I counted 39 days and nights. I remember, because I was wondering if it would top the Biblical 40."

Then late one afternoon the skies suddenly cleared. The rain-washed air breezed sharp and clean. Mountains that rim Vancouver's harbor leaped into view, their tree-quilled sides climbing steeply from the sea, their snow-topped peaks sharp-lined like a painted backdrop. Along the waterfront the play of fading light wrought a palette of mixing colors. I watched the changes, entranced. And with that moment I awoke to the truth of the slogan stamped on the province's auto license plates: "Beautiful British Columbia."

Province Provides a "Grateful Task"

I recalled some words I had jotted in a notebook, and I turned to them. They were penned by Capt. George Vancouver, the methodical British navigator who from 1792 to 1794 charted the region. "The serenity of the climate," he wrote, "the innumerable pleasing landscapes, and the abundant fertility that unassisted nature puts forth, require only to be enriched by the industry of man . . . to render it the most lovely country that can be imagined." Describing its beauties would "on some future occasion, be a very grateful task to the pen of a skillful panegyrist."

I looked again at the city named for the captain and snapped my notebook shut. My talents, I regretted, weren't up to that task.

The wish for the skills of a eulogist was to repeat itself often as I hopscotched the 16,900 miles of British Columbia's coastline. The fiord-wrinkled, island-freckled face of this continental rim from which Canada looks at the Pacific lies tortuously compressed into a 500-mile crow flight from Washington State's northern border to Alaska's southern tip (map, pages 346-7, and the supplement map **Canada** distributed with this issue).

"Nothing but rocks, bush, and water," Canadian friends repeatedly said. But rocks that hold vast mineral treasure! Bush that feeds ubiquitous lumber and paper mills! Water that creates fisheries and power and recreation pleasure! Here beckons the challenge of a developing land, the contrast of city spread and empty wilderness. Here balance the surge of youth and the ease of golden retirement. I hopscotched, and I marveled.

Warm Current Makes Mild Winters

Some 25 million years ago a ponderous chunk of earth's crust sank, drowning all but a mountain range. Thus was formed Vancouver, biggest island on the Pacific coast of the Americas. Formed, too, were the little-traveled Queen Charlotte Islands and the uncountable islets and humps that pepper the Inside Passage between the mainland and the great offshore chain. Glaciers gouged out narrow valleys where the sea reached in with probing fingers.

Today that sea washes British Columbia's shore with a warm current sweeping north, which accounts for the mild winters of this region—and the rain clouds that drench western slopes of its mountains with as much as 300 inches a year, then, wrung out, sprinkle the southern interior with as little as ten.

A great deal of British Columbia is as empty today as when Captain Vancouver coasted its shores. Of the 2,200,000 people in the vast province—bigger than Washington, Oregon, and California combined—nearly three-fourths crowd the southwestern tip; more than half live in the Vancouver metropolitan area alone. Why do they flock here?

"I get a bit smug about this place," young,

Melting as it falls, wet February snow sends Vancouver shoppers scurrying. Though farther north than Montreal and Quebec, Canada's third largest city enjoys unusually mild winters, thanks to a warm Pacific current that surges past Canada's westernmost province.





Where nature is lavish, men are shrewd enough to gather. Such a place is spectacular Vancouver, a frontier village grown to a million-strong metropolis. The city's 20th-century



skyline of concrete and glass thrusts up against a backdrop of the Coast Mountains, here snow-silvered in midwinter. Wooded Stanley Park, a 1,000-acre peninsula, juts into Burrard Inlet; residential suburbs climb the distant foothills. Expressway at lower left leads to the United States, 32 miles to the south. Log rafts bound for lumber mills float in the foreground.

articulate Jim McLellan, a city bus driver, explained over a leisurely cup in a downtown coffee shop. "Why, for 25 cents you can ride a bus on one of the most scenic drives imaginable." From the heart of Vancouver, he explained, the route goes past the high-rise apartments of the West End, through the virgin forest of Stanley Park, and across the Lions Gate Bridge that connects Vancouver's peninsula with the other side of the harbor. "You pass hillsides that make you wonder how houses can hang on, and out to Horseshoe Bay with its docks and boats. All in 13 miles!

"Lots of places can offer the sea, or mountains, or big-city attractions. But few concentrate them like we do. Where else can you go skiing in the morning and golfing or boating in the afternoon—all no more than a 20-minute drive from downtown?"

Snow does coat the tops of Vancouver's peaks from November to April; the aerial tramway that whisks you to ski slopes on Grouse Mountain operates all year—and provides a 3,700-foot vantage point for an awesome panorama of city and harbor at your feet (pages 338-9). On a clear day, that is.

"Gassy" Tales Gave Town a Name

It was absolutely clear the afternoon I sat in the window-walled waterfront office of Capt. Roy E. Holland, harbor master of the Port of Vancouver.

"I never get tired of watching the harbor," he said between draughts on a pipe. "The water will turn from a deep blue to a dull gray in a dead-flat calm; it changes again when the wind is from the east.

"But that's not the only thing that changes. As a young seaman from London I used to swim off a mudbank right here where this office stands. Now look at the harbor! Lined with docks and drawing some 2,000 deep-sea vessels on the average every year."

From Captain Holland's boss, port manager William Duncan, I had learned some facts about this bustling waterfront.

"Development of a busy port in such a spot as this is quite a phenomenon. We didn't have navigable rivers like the Hudson or Mississippi to spur our growth with waterborne tonnage. Yet in 1971 we handled 35 million tons of dry cargo—more than any other port on North America's west coast."

Vancouver got its start as a port almost by accident. In 1867 little stood on the spot except a few buildings clustered around a saloon run by a picturesque riverman named



After the day's last volley, young tennis partners—newcomers from eastern Canada—replay their game on the greensward of Vancouver's West End. Sun-gilded apartments flank English Bay.

Under winter's robe, Stanley Park offers a lonely haven to swans and ducks on Lost Lagoon. In summer as many as 20,000 people come each day. Only a 15-minute walk from Vancouver's heart, the park greets visitors with an aquarium and zoo, picnic grounds, beaches, swimming pools, a miniature railway, and playing fields. Through stands of virgin forest wind 27 miles of trails. On Sunday mornings bicycles are the only wheeled vehicles permitted.



Capt. John Deighton. Long, boring tales earned him the nickname "Gassy Jack," and the community—officially Granville—became known as "Gastown."

Nearby New Westminster on the Fraser River already was a thriving settlement. Victoria, 60 miles across the Strait of Georgia on Vancouver Island, had seen 15,000 men pass through town in the 1858 rush for gold up the Fraser. These island and mainland colonies joined in 1866 to form British Columbia, and in 1871—swayed by the promise of a transcontinental railroad as a link to the rest of Canada—voted to become a province in the new Canadian Confederation.*

That railroad was to have had its western end at Port Moody, farther inland. But when crusty railroader William Van Horne saw the train-yard and wharf possibilities of Gastown, he ran his tracks there. With their arrival in 1886 the town was rechristened Vancouver, and went on to eclipse Port Moody, New Westminster, and Victoria.

Helping Hand From a Faraway Canal

Vancouver grew as an exporter of lumber and fish and an importer of manufactured goods. The port got a real boost with the opening of the Panama Canal in 1914. It became as cheap to ship prairie grain to Europe from Vancouver as from Atlantic ports. Its most recent boom has come since 1960 with export of bulk mineral cargoes.

The morning after my talk with Captain Holland I went down to the Seaspan International Company's pier to join a tugboat crew. Yesterday's brilliance had changed to rain—and soggy flakes of Vancouver's "unusual" snow. But skipper Jim Young of the *Island Rustler* didn't seem to mind. Bareheaded, he'd climb to the auxiliary controls atop the 47-foot vessel's wheelhouse and jockey a lumber barge to a mooring or pick up a derrick scow.

Our radioed job orders took us past a Greek freighter lying high in the water. Past the *Toyota Maru* bringing in automobiles and taking back coal to Japan. Past a grain ship swinging aboard an extra deck cargo of lumber, a Russian vessel picking up supplies for the fishing fleet it mothers at sea. And by the time *Island Rustler* squeezed a 48-foot barge through a 50-foot bridge span—with a tide

*The May 1967 NATIONAL GEOGRAPHIC included "Canada Marks Her First Century," by Melville Bell Grosvenor. See also "Canada, My Country," by Alan Phillips, December 1961.





So big, yet so thinly populated: Canada's Pacific province is home to only 2.2 million people—less than a fifth of New England's total in a region five times as large. As in the vastness of Alaska, planes play a vital role in travel and communications; airports and harbors for floatplanes dot the map. Automobile-and-passenger ferries make a 665-mile run through the scenic Inside Passage from Seattle to Prince Rupert. Glaciers crowning the Coast Mountains are the remains of vast ice fields that carved British Columbia's myriad fiords.


The rugged coast of British Columbia
Inside Passage
Ferries
Airports
Floatplane harbors
Goldfields of the 1858 gold rush
Glaciers
Elevations in feet
STATUTE MILES
Horseshoe Bay
North Vancouver
Port Moody
English Bay
VANCOUVER
New Westminster
Strait of Georgia
Boundary Bay
COAST MOUNTAINS
Smithers
Terrace
Burns Lake
Kitimat
François Lake
Kemano
TWEEDSMUIR PROVINCIAL PARK
Quesnel
CARIBOO
Ocean Falls
Bella Coola
Bella Bella
Namu
Williams Lake
Monarch Mt
Rivers Inlet
Sound
Calvert Island
Mt. Waddington
Chilko Lake
Mt. Tiedemann
Clinton
Cape Scott
Port Hardy
Alert Bay
Port McNeill
Queen Charlotte Strait
Lillooet
Kelsey Bay
Stuart Island
Pemberton
Lytton
Cape Cook
Fair Harbour
Kyuquot
Zeballos
Tahsis
Campbell River
Powell River
Vancouver
Gold River
Courtenay
Squamish
Howe Sound
Hope
Pacific Ocean
Island
Nootka Sound
Port Alberni
Nanaimo
Strait of Georgia
ENLARGED ABOVE
VANCOUVER
Chilliwack
CANADA
UNITED STATES
Tofino
Ucluelet
Ladysmith
Duncan
Sidney
Bellingham
San Juan Islands
Port Renfrew
VICTORIA
Anacortes
WASHINGTON
Cape Flattery
Strait of Juan de Fuca
Port Angeles
Everett
OLYMPIC NATIONAL PARK
Seattle

running and the barge heavy with 40 railcars' worth of pulp chips—I had gained a deep appreciation of the skilled men and sturdy boats that make a harbor live.

A day later, I heard about other ramifications of the port's growth from John McKeown, a blue-eyed Scot and an economist with the Greater Vancouver Industrial Development Commission.

"Because of the Rocky Mountain barrier between us and the rest of Canada," he explained, "our economic and social ties for a long time were more with Seattle and San Francisco than with Toronto and Montreal. But with the jet age, and Canada's realization that it is as much a Pacific nation as an Atlantic one, there's been a vast change. We've seen an abundance of resources come charging out. And for new customers. Wheat for mainland China. Coal for Japan. And new techniques for handling bulk ores and materials."

The Whole World Flocks to Vancouver

The expansion has created problems, however, Mr. McKeown added. "It has attracted people from everywhere—70,000 new residents in 1970 alone. British Columbia has a lot of room, but everybody wants to live and work right here. That means pressure for jobs; we now have an unemployment rate of around 7 percent."

Wherever I turned on downtown streets, I sensed a surge of building. Construction cranes hung over block after block—a tower for a new hotel and office center, a department-store complex, new concrete hives for parking. Bricks and lumber marked rebuilding in Gastown—a onetime skid-row section that capitalizes on "Gassy Jack" Deighton's heritage and now offers something for everyone: "way out" boutiques, restaurants in renovated old factories, a Maple Tree Square said to be the liveliest intersection in the city.

I sensed, too, the tremendous influx of new people. Along Robson Street in the heart of the city, storefront signs reflect Vancouver's cosmopolitan character—a Danish Tea Room, a European News Shop, an Old Country Bakery, an India House.

My hotel's doorman, I discovered, hailed originally from Ireland. My waitress had arrived recently from Austria. One of my cabdrivers came from Yorkshire, another was a student from Fiji, working his way through college. A turbaned Sikh sold me stamps over a counter in the post office. Italians, Japanese, Germans—you name them—all have nationality groups in the city. But the incident that for me spotlighted Vancouver's ethnic variety happened one sunny winter afternoon. Two old men lounged against a wall, letting warmth soak into aged joints. It was in the heart of Chinatown; both were Occidentals—and speaking French.

Vancouver claims the largest Chinese community in Canada (page 353). But Roy Mah, a publishing executive and a past secretary of the Chinese Benevolent Association, surprised me when he said that Chinatown's preservation was more a concern of the non-Chinese population.

"Immigrants from China provided a labor force that helped develop British Columbia," he explained. "There was fierce discrimination, and cultural enclaves like Chinatown developed. But today people of Chinese descent are scattered all over the city. Not so many of the younger generations keep close ties with the old community; they are Canadians first and Chinese second. Vancouver chamber of commerce types worry that Chinatown might disappear as a tourist attraction."

Victoria Keeps Its British Bearing

While Vancouver takes interest in preserving its Chinatown, British Columbia's capital looks to maintaining its Britishness. Part may be pose—the horse-drawn tallyho coaches that carry sight-seeing tourists, for example. But much is genuine and deep-rooted.

The proper old Empress Hotel sits in watch over Victoria's harbor like the stately dowager she is. Proper waiters serve tea in her lobby of an afternoon; sociable old ladies—and certain impressionable journalists—sip there with delight. Alcoves where soft-drink machines are kept for room guests have overhead signs reading "Ice and Minerals." In bathrooms, white-painted wooden stools hold folded towels a convenient step from the tub.

The city's Beacon Hill Park offers a cricket pitch next to a softball field; swans in park ponds come from Her Majesty's swannery. Yellow dots on the pavement guide motoring tourists past such attractions as Craigdarroch castle, built by a Scot for his ladylove, and hillsides of gorse supposedly seeded in early days by another Scot who wanted Victoria to look like his native land.

"We still have 'remittance men' living on

monthly checks from England," M. E. Heppell, who heads the Victoria Visitors Bureau, told me. "And you can find British types who wear jackets while gardening and regard as plebeian anybody seen in his braces. Shops on downtown streets specialize in English china, toffee, tweeds, woolens—tempting buys for the 2.5 million tourists who come to Victoria every year."

I saw one of the effects of that visitor flow on a walk along Wharf Street one summer day—a blocks-long line of cars waiting for the ferry to Port Angeles in Washington. Only one had a British Columbia license plate; the rest bespoke origins in Alaska and 17 different states south of the border.

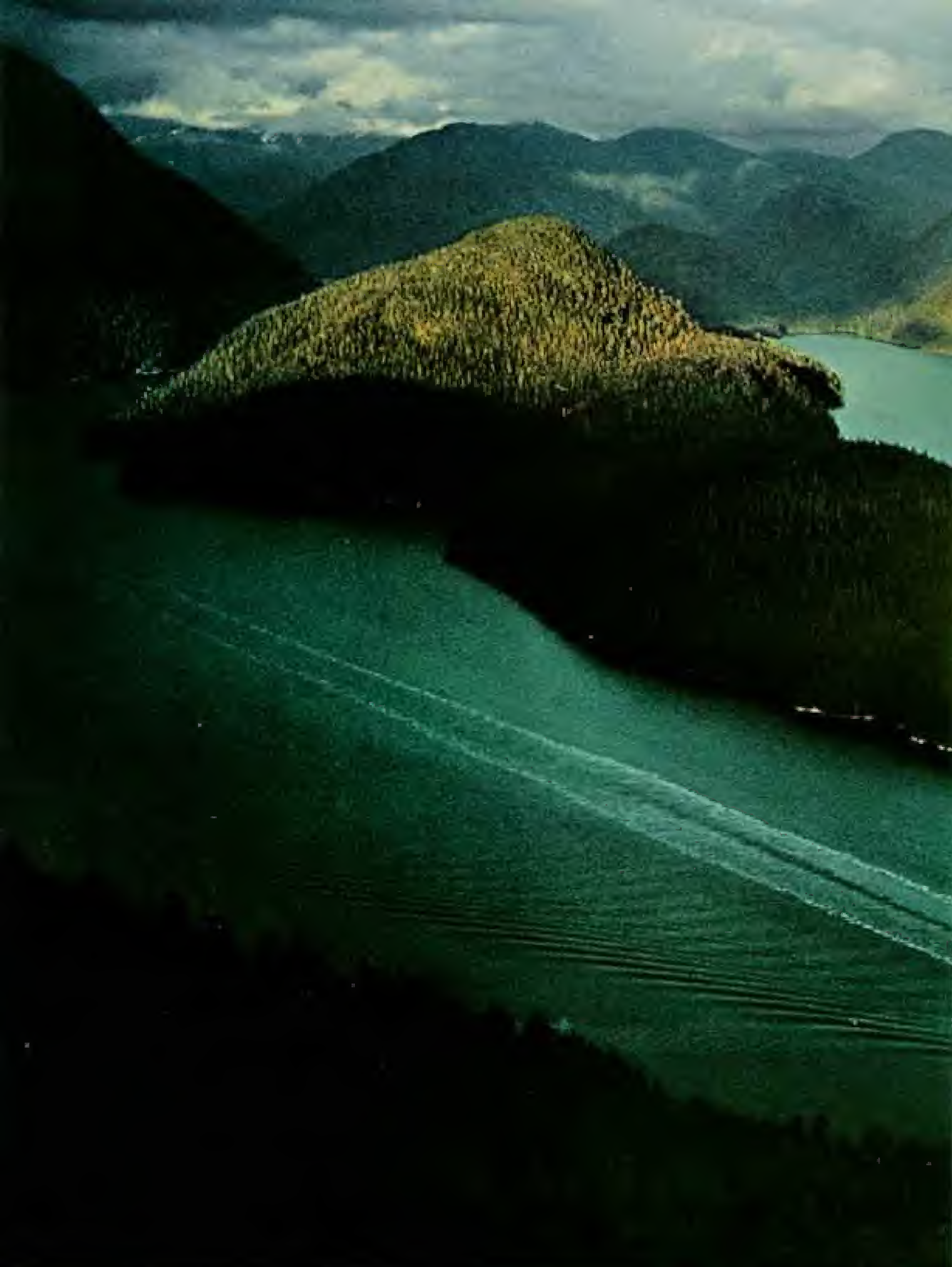
But Victoria has native visitors, too—cold Canadians. This tip of Vancouver Island, with its January temperatures averaging in the 40's and rainfall a mere 28 inches a year, is Canada's "south." It particularly attracts vacationists from the frozen cattle ranches and grainfields of the Prairie Provinces.* So many that one Victoria paper carries a feature titled "Prairie News" to keep visitors informed about happenings at home.

The climate and the serene pace of life in this provincial capital draw more than visitors. Retirees flock here. Nearly 20 percent of the area's 185,000 people are past the age

*W. E. Garrett wrote of "Canada's Heartland, the Prairie Provinces" in the October 1970 GEOGRAPHIC.



Golden wheat from the Prairie Provinces funnels into a Japanese ship at Vancouver. The city ships out more than 250 million bushels of grain a year. Wharves also pile high with lumber, canned fish, fruit, fertilizer, coal, and ore.



Spiked with giant evergreens, islets and peninsulas of 280-mile-long Vancouver Island create a watery maze. Trailing twin



ribbons of froth, a bulk carrier heads for a sawmill at Tahsis to pick up a load of lumber destined for Europe. The history of British Columbia began on this island in 1778, when Capt. James Cook, on his last voyage, claimed the region for Great Britain.

"'Arf a mo', guv'nor, for a pipin' 'ot potato!" Cockney accent and shell buttons identify "Pearly," a London emigrant in Victoria, capital of British Columbia. Justifying its longtime nickname—"A Bit of England"—Victoria cherishes the horse-drawn tallyhos and double-decker buses that carry visitors on sight-seeing tours of the city.



Savory ducks, chickens, and pork tempt a shopper in Vancouver's Chinatown (opposite). Only 7,000 of the city's 45,000 Chinese live in the 11-block district. Large Japanese, Italian, and other ethnic communities also enrich the city's population.

of 65. Special benefits accrue to them. Signs in barbershops advertise "Haircuts $2.25, Pensioners $1.50," for example. And government and social agencies cooperate in maintaining "Silver Threads" centers.

Still, all is not roses for the elderly. "Making ends meet on a limited budget is difficult for retired persons," Catherine Horne, a social worker in charge of the downtown center, explained. "We deal mainly with people of marginal incomes—ones with, say, $150 a month and a walk-up room. Here we offer inexpensive lunches, counseling, medical help, crafts, and activities—offsets for the loneliness and emotional doldrums that are major problems of the aged.

"Retired persons pay $2 a year for membership. We have more than 6,000 on our rolls, but there are those who won't join. One of our volunteer workers refused; she said she wasn't old enough. She's 80."

Climate Abets Senior Green Thumbs

Gardening is a favorite activity of retirees—and of most Victoria residents. Nowhere in my travels have I seen neater lawns, or such a house-to-house profusion of blooms. Baskets of flowers drape downtown lampposts from spring to fall. Positively breathtaking are the nearby Butchart Gardens, admired by 400,000 visitors each year. Started by Jennie Butchart, wife of a cement magnate, to erase the eyesore of a worked-out quarry, the gardens now beautify an estate of 136 acres—35 of them intensively landscaped—sporting such tactful reminders as "Dogs must keep owners on leash."

"With only two or three winter frosts, and summer temperatures seldom in the 90's, we can grow a wide range of plants here," park superintendent Alan Smith told me. "So there's a lot of interest in gardening."

Then he put a damper on my green-thumb enthusiasm. The long growing season, he said, means lawn mowing ten months of the year.

James Douglas, who in 1843 established Fort Victoria as a trading post for the Hudson's Bay Company, undoubtedly rates as discoverer of Victoria's gardening possibilities. The land's "dark vegetable Mould," he wrote, made the area "a perfect Eden in the midst of the dreary wilderness." By 1849 the post had become a thriving village and thirteen years later, at the height of the gold rush on the Fraser, had burgeoned into a city.

The boom brought gold-hungry argonauts—"the very dregs ... of society," an observer


KWONG HING CO

wrote. It also brought such stalwarts as Matthew Baillie Begbie, sent from London in answer to Douglas's appeal for a magistrate. A giant of a man, Begbie established authority with a firm hand and shrewd justice. Once, settling a dispute between two brothers over division of an inherited farm, he decreed: "You, James, will divide the property into parts as equal as you can make them. Then you, John, will have first choice."

Holding court in mainland mining camps, and even on horseback in open fields, Begbie brought order to a raw frontier, made the colony a model of decorum. Victoria still is. Its pace is geared to the role of provincial capital with little in the way of heavy industries. A lot of people like it that way.

As Mike Heppell, my friend at the Victoria Visitors Bureau, put it: "You won't make a million dollars here. But you'll live 20 years longer, and after a while you'll realize you don't need a million."

Weird Craft Race From Nanaimo

North from Victoria stretches the longest paved highway along British Columbia's coast. The distinction is dubious, since most routes up and down the coast are paved with water or air. Except for an 85-mile stretch north from Vancouver—involving two ferry crossings—no other road challenges the forests and fiords of the coast. To travel that region, you go by boat or by plane.

The highway out of Victoria takes you up the eastern side of 280-mile-long Vancouver Island. Pleasant communities dot its meanderings. Nanaimo, where an annual "bathtub" race sees outboard motors power outlandish vessels across the strait to Vancouver. Courtenay, with its small farms and dairies. Campbell River, whose character leaps out in a traffic marker—"Resort area next 15 miles, watch out for pedestrians"—and where a local daily, though poking fun at the *greenus spendus* species that flocks there each summer, editorializes against "Yankee go home" slogans sometimes chalked on trailers from the States. Canadians, I was reminded, may jest about the extent of U. S. investment in their land, but the layer of levity is thin.

Two cross-country highways divide Vancouver Island roughly into thirds. Except for these, logging-company roads provide the main access to most of this 12,400-square-mile realm. I followed the southern highway to Port Alberni, at the head of an inlet that reaches to mid-island. I wanted to take a look at what is billed as "the largest integrated forest-products complex" in the world. There divisions of MacMillan Bloedel Ltd. mesh operations to ensure that as much of the tree as possible is used. Waste from one plant becomes raw material for another.

I watched a pulp mill spewing ribbons of paper from machines at half a mile a minute. I saw powerful jets of water peeling bark from logs as easily as you would peel a banana, and saws masterminded by computers slicing those logs into lumber. I tramped a plywood plant where amazing equipment spits out equally amazing stacks of plywood



Pondering the big question: On a brilliant August afternoon, not too warm, not too cool, senior lawn bowlers plan their next play in Victoria's Beacon Hill Park. For generations the city has been a haven for retired military officers and for prairie farmers prosperous enough to escape the bitter winters of mid-Canada.

—60 minutes from log to kiln-dried sheet. And I noted a sign beside a plant roadway spelling out "Exit" in eight languages, including Greek and Chinese.

"Because your employees are of such varied nationalities?" I asked.

"For seamen on shore leave," a company official explained. "Ships dock here to take our products all over the world."

Manufacturing integration came to the forest-products industry only a score or so years ago. Before, when waste from processing at individual mills almost equaled the waste from stumps and limbs left in the forest, only 26 to 30 percent of the tree was actually utilized. Now, with one neighbor mill feeding its leftovers to another, 40 to 45 percent of the tree is used. And research seeks ways to pare the left-in-the-forest waste.

"Many new forest products exist today that hadn't been developed ten years ago," Dr. Lionel A. Cox, MacMillan Bloedel's director of research, told me. "We can devise many more, but the problem is not so much technological development as how to get the raw material from the woods and how to market the product economically."

Then he showed me an array of items his scientists have produced. Fertilizer with a marvelous woodsy smell, made from bark—at present one of the biggest items of waste in the industry and used mostly as fuel. Perfumes and oils extracted from the needles of conifers. Plastics created from resins and other wood constituents. Particle board made from shavings and sawdust.

Later I talked to William H. Mehaffey, manager of environmental control for MacMillan Bloedel, about pollution wrought by logging and paper-mill operations (page 359).

"The industry has made significant strides in pollution control, and important research is going on," he said. "Our company has spent $20,000,000 to curb pollution. Precipitators in smokestacks have eliminated 99.5 percent of the solid particles in smoke from







Swarm of sails streaks from Victoria Harbour as the annual Swiftsure Race gets under way. The fleet heads toward the Strait of Juan de Fuca and the shallow bank that gives the contest its name. With favorable winds, yachtsmen can run the 145-mile course in as little as 24 hours.

Film recording his catch, an angler reels in a salmon at the mouth of Bute Inlet. Fishing, whether in such peaceful surroundings or in the bustle of derby competition, lures many of the 7,500,000 tourists who visit the province each year.



chemical-recovery operations—the major source of pollution from papermaking.

"The industry is concerned about waste going into streams, about harm from logging operations, and damage to the environment where we dump dredging spoil. I think that in 10 or 15 years we'll see a reduction of 90 percent in the amount of pollution. But there may be an irreducible minimum."

From the mill town of Port Alberni the highway led me to the wet and rugged west coast of Vancouver Island. Part of the route was a washboardy gravel that switchbacked over the island's mountain heights. Snow still lay in pockets on the morning sides of the peaks, though it was August. Logging-stripped hillsides showed the green underwear of new growth, and fireweed in bloom trimmed it with purple.

Then at last the road dipped to the coast—to skirt sandy, seven-mile Long Beach and to link a town with the tongue-clacking name of Ucluelet to the fishing village of Tofino; there a sign by a nondescript dock grandiosely proclaims: "Pacific terminus of the Trans-Canada Highway."

At Tofino I chanced upon fringe-jacketed Rick, 19, and jeans-clad Susie, 17. They had come to pick up their general-delivery mail from hometown friends in Alberta. From them I gained an insight into the life of the young people who have broken with traditional ways to meet each day as it comes in the pleasantness that is British Columbia.

Rick and Susie were living in a rustic cabin "a 400-foot climb off the road." It was sounder than the makeshift shelters fashioned from driftwood and canvas and plastic by some of their friends along Florencia Bay—nicknamed Wreck Bay from the ships driven

ashore in Pacific storms. The young people live off mussels and crabs found along the beach, an occasional fish handed them by commercial fishermen, a few "bought groceries," and roots and berries from the woods —"you can find out a lot from books and pamphlets in the libraries," Susie said.

The days of such back-to-nature vagabondage at Wreck Bay are ending, however. The Canadian Government is developing its Pacific Rim National Park and will extend to the area the regulated conformity that now fills most of Long Beach with trailers.

I pondered the incongruity while retracing the road to the populous eastern shore of Vancouver Island—then promptly forgot it all in awe at the primal majesty of giant firs in Cathedral Grove of MacMillan Provincial Park, just east of Port Alberni. Man's machinations seemed so inconsequential there.

New Town Now Home to 2,000

The northern highway across Vancouver Island takes you to the "instant town" of Gold River. From Len Garrison, bank manager and chamber of commerce official, I learned how it grew.

"The town sprang up sort of overnight when the Tahsis Company built a pulp mill at the head of the inlet a few miles away. It laid out the community to attract employees. Eight years ago there was nothing here but woods full of game and streams full of fish. Now Gold River has a population of 2,000."

But its woods and streams still delight sportsmen. I saw proof in a 15-pounder that had won the town's Steelhead Derby.

"Some people object to derbies," fishing guide Frank Collins told me. "The British Columbia Salmon Derby draws around 11,000 anglers and so many boats you can almost step from one to the other across Howe Sound on the days it's held. The fisherman catching the biggest salmon wins a $25,000 prize. You'd think the fish have no chance, but it's a fact that all those anglers together don't land nearly as many salmon as one commercial fisherman takes in one good haul with a gill net."

Figures suggest that spending by sports fishermen brings to B.C. a bonanza rivaling its income from commercial fisheries. As a result—and as a conservation measure—many inlets have been closed to seiners and gill netters and reserved for sportsmen.

"Downtown" an All-day Trip for Some

From a pier where the Gold River empties into Muchalat Inlet the *Uchuck III* begins her two-day round-trip run. A World War II minesweeper converted into a freighter-passenger ferry, she serves isolated settlements along the waterways branching from Nootka Sound. Vessels like her play vital roles in B.C.'s road-shy expanses (pages 350-51).

I watched her white-haired skipper, Capt. H. Esson Young, hop from bridge to crane-control pulpit, nursing the *Uchuck* to a dock or swinging aboard a load of cargo. At one stop it was a pallet of acetylene tanks, at another an engine going out for repairs—"one time even a Shetland pony, a gift for some kids," the skipper related. Trickles of passengers got on and off: loggers returning to jobs in the woods, a cowboy-booted youth carrying a rifle, couples "going downtown"—as upper-island residents heading for Victoria or Vancouver are wont to say.

Aboard the *Uchuck* I traveled to Friendly Cove, little more than a government-operated lighthouse and a cluster of weathered homes. There live eight Indian families—all that remains of the thriving community whose hospitality Capt. James Cook enjoyed on his discovery voyage in 1778.* In the heyday of the sea-otter trade thus opened, 30 ships a summer visited the cove; today the otter, protected, is making a comeback.†

I trod the beach's shifting gravel and climbed to a windswept little church atop a

*Alan Villiers wrote of Cook's voyages in "The Man Who Mapped the Pacific," GEOGRAPHIC, September 1971.
†Biologist Karl L. Kenyon told of the "Return of the Sea Otter" in the October 1971 GEOGRAPHIC.

Beauty and the blight: Amid some of the world's most awesome scenery, industry struggles to stay ahead of pollution. At the Nanaimo pulp mill of MacMillan Bloedel Ltd., titan of Canada's wood and paper companies, clouds of smoke and steam veiled the rising sun last spring. The company is now installing new precipitators to reduce air-polluting particles in the smoke by nearly 80 percent. British Columbia's forest-products industry plans to spend $85,000,000 on antipollution equipment in the next five years.



ridge that shoulders the Pacific. In the church a stained-glass window depicts the 1792 encounter between Captain Vancouver and Juan Francisco de la Bodega y Quadra, who met at Nootka Sound to implement an earlier treaty yielding Spain's shaky hold on the region. For minutes I lingered before the window. Its beauty, I reflected, somehow seemed to make up for the sad eclipse of this spot where British Columbia's history began.

The *Uchuck*, on request, will stop at such places as Charlie O'Hara's floating lumber camp on Tahsis Inlet. Mr. O'Hara was "on holiday" when I went there, but I spent a jovial time learning about loggers from Ann Hill, the camp's cook (page 363), who was varnishing a kitchen table when I arrived.

I asked if woodsmen were the prodigious eaters I had heard them to be.

"Well," she replied, "we have a crew of eight in this camp, and they'll put away a seven- or eight-pound roast and four pounds of potatoes in a meal. But it's a funny thing: they just love salads, and a single pie or cake will last a week."

My faith in Paul Bunyans was shattered.

Eighty Years Pass Between Harvests

The buildings of O'Hara's camp perch on rafts so they can be towed from one shore site to another. But such camps are a dwindling phenomenon. Using small crews and relatively minimal equipment, they log tracts on contract for larger companies. They bring out timber from the few areas where terrain or other factors make it uneconomic for the big operator to go in with his road builders and huge logging machines.

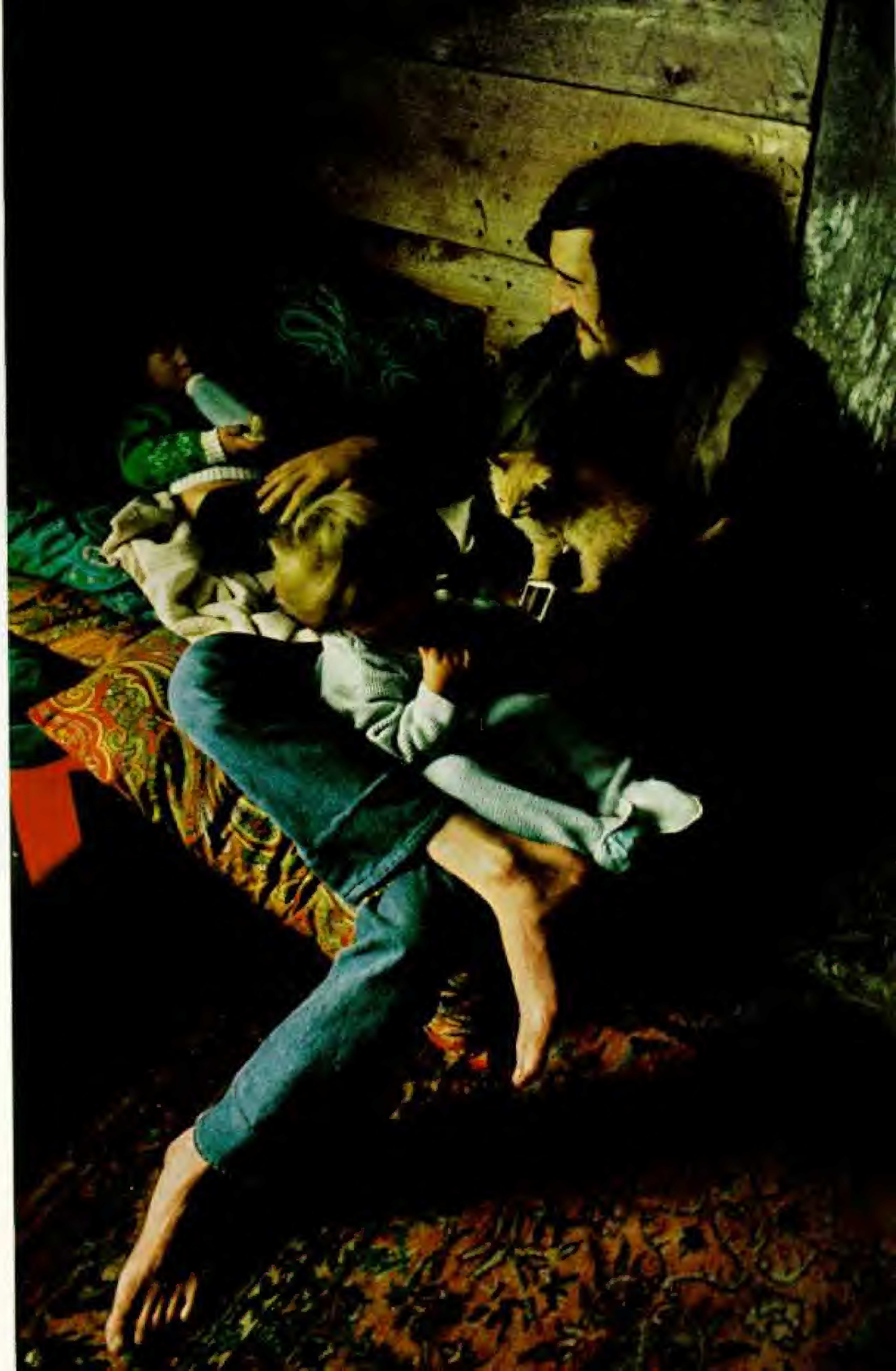
Just as forest utilization has made great strides, so has forest management. Logging today is done on a "sustained yield" basis, with industry and government cooperating to assure future supplies of a precious resource.

"Companies plant as many as four trees for each one cut," Doug Adderley, an official of the British Columbia Forest Service, explained. "Replanted tracts in about eighty years will grow enough to be harvested again. And we're working on ways of producing trees that will grow better and faster.

"Genetic research promises us answers. But because a conifer's lifetime is so long, a scientist starting a crossbreeding project today probably won't be around to see the results. Still, we're pretty sure that genetically we can do for trees what has been done for wheat and rice and corn."

Swapping city ways for country life, former schoolteacher Jim Green emigrated from California to British Columbia three years ago. On a 15-acre farm he raises vegetables, fruits, and herbs for his organic food stores—"Sun and Seed"—at Alert Bay and Port Hardy. At day's end (**right**), Mr. Green plays with his daughters Bre and Ajana in the rough-planked living room of their 60-year-old farmhouse. With the aid of the two tots, Jenny Green picks peas (**below**).







Already replanting is producing better trees than those being cut. Foresters range timberlands, selecting the choice trees from which to collect seed cones. Restocking is a partnership between government and industry. Company employees help collect cones and plant seedlings; the Forest Service stores the seeds and grows nursery stock.

Teamwork also modernizes logging operations. Cutting in alternate strips, in herringbone patterns, or in leapfrogging patches encourages natural reseeding of logged areas. Leaving green belts along streams prevents bulldozer damage to salmon spawning beds and the temperature rise in sun-heated waters that can kill fish fry or eggs. The emphasis today is on maintenance of resources. "The old practice of 'clear-cut and get out' is gone for good," one company official assured me.

Change comes, too, to the ways of British Columbia's earliest inhabitants. Tribes of the coastal region—particularly the Kwakiutl, the Haida, and the Tsimshian—had one of the most colorful cultures among North American Indians, with skills in carving and pictorial art hardly surpassed anywhere in the primitive world. But adaptation to 20th-century civilization has brought problems.

"That acculturation still goes on," said J. V. Boys, senior liaison officer in Canada's Department of Indian Affairs. "Some individuals can't, or won't, adjust to modern life's demands; perhaps the white Canadian's conscience has made him overindulgent toward the Indian, promoting and compounding a dependency. But you see many examples



With a gargantuan splash, 20,000 tons of logs slide into Howe Sound. Water automatically pumped into the *Island Forester*'s tanks heels the vessel at a 35-degree angle. For long hauls, such self-loading, self-dumping barges have almost completely replaced tug-guided log rafts, which sometimes break apart in rough water.



Clanging pans announce dinner at O'Hara's floating logging camp in Tahsis Inlet.

of the successful meshing of the two cultures."

British Columbia has 1,625 Indian reserves, nearly three-fourths of Canada's total, though some are only villages. I took a look at one in Alert Bay, off Vancouver Island. Its frame-and-cinder-block houses climb a hillside and edge a waterfront street looking out on docks and fishing boats. In one of those homes I interrupted a Sunday-afternoon television movie that James Sewid, a hereditary Kwakiutl chief, was watching.

"The Indian population here is about 800, and nearly all the men are salmon fishermen," he said in answer to my questions. "I paddled a canoe as a boy and now look what I have—five seine boats that my sons and I run. The opportunities are here for the Indian who wants to take advantage of them."

Married before his 14th birthday—"my 15-year-old wife gave me measles as a wedding present"—Mr. Sewid has been a key figure in community development and insistence on the Indians' right to self-determination. I saw one result of his leadership in a new community house, a copy of one of the great tribal houses that impressed early-day explorers. Totem poles supported its roof and cedar planking formed its sides.



"We put on dances here for tourists from cruise ships," the chief said. "But they are authentic dances, not commercialized versions. With them we help keep alive songs and traditions, and a lot of the young folks are taking new interest in their heritage."

Northwest from Alert Bay, across Queen Charlotte Sound where the Pacific sweeps unimpeded against the mainland, lie the lonely Queen Charlotte Islands. This was the haunt of the Haidas, a proud and skilled people whose daring canoe raids made them feared as the "Vikings of the Pacific Coast." At Skidegate Mission, a village on Graham Island, largest of the Charlottes' 150, I dropped in on Rufus Moody, a modern Haida.

He sat in his seaside studio, carving; Mr. Moody is widely known for his exquisite totems and plaques fashioned from argillite, a slatelike stone (following page). The material is found in a hard-to-reach island quarry; by law, only the Haidas may mine it.

Island Haidas numbered about 8,000 when the white man came. His diseases reduced the population until in 1900 only about 600 were left. Now the total is 1,500. Most hold jobs as fishermen or loggers.

Neighbors Tolerant of Drying Bones

The scantily inhabited Queen Charlotte archipelago—its white population only twice as large as its Indian—appeals to people who value isolation. Like the booted, rawboned chap from Wyoming who shared space in a chartered floatplane with me; he was casing the Charlottes because "Wyoming is getting too crowded." Or like Neil and Betty Carey, who built a cabin in a protected cove on the rocky west coast of Moresby Island—the group's second largest; in three months there they "saw only one ship, no aircraft, and no people. And loved it."

Neil is a retired U. S. Navy commander, Betty a sun-bronzed boating enthusiast from Washington State who has traced Haida coastal routes in her own dugout canoe. They also have a home in Sandspit, metropolis of Moresby Island—population 500. The Careys' picturesque palisade, made of driftwood logs set upright, encloses a yard full of items gathered in beachcombing—including a whale skeleton weathering in the sun.

"Where else could you let whale bones dry without neighbors' complaints?" Betty asked.

Barely touched resources enrich the Charlottes. Muskeg bogs on Graham yield high-grade sphagnum moss for gardeners in the United States. Iron ore and copper deposits on Moresby make Tasu a thriving settlement. In the forests, red cedar and giant Sitka spruce, some as much as 17 feet in diameter, fall to the logger's saw. Streams jump with trout and salmon; deer—descendants of



Storm of sawdust swirls about a logger as he begins his cut on one of the great Sitka spruces of the Queen Charlotte Islands. Forest products account for half of every dollar earned by the people of the province.

Totem-littered ruins of a long-abandoned village—now part of a government reserve—bespeak a tragic chapter in the saga of the Haida Indians. A strong, skilled people, they were the Vikings of North America's west coast, trading and raiding in 50-foot-long canoes. In the early 19th century an estimated 8,000 lived in elaborately decorated cedar dwellings in the Queen Charlotte Islands. Settlers brought European diseases, and by 1900 only a few hundred Haidas survived. Today an estimated 1,500 comprise a third of the population of the Queen Charlottes.



Keeping alive a unique art, Haida tribesman Rufus Moody carves a totem pole of "Haida slate." The artist shapes stylized figures from his people's legends—including a mother bear and two cubs, a raven and a frog, a sea monster with two whales, and an eagle. The 35-inch-tall sculpture sold for $2,500.





Honoring the dead, Kwakiutl Indians perform at a potlatch given at Alert Bay by 94-year-old Chief Jonathan Hunt in memory of his wife. Gathered in the community house, guests watch a family story enacted in song and dance. Later they will receive a lavish array of gifts—everything from $20 bills to clothing—from the host.







Concerned citizens stage an ecology rally at Peace Arch Park on the U.S.-Canada border. Fearing accidental spills, they gathered to protest a plan for U.S. supertankers to transport oil along their coast from Alaska to Cherry Point, Washington.

Subjects of concern: Sea anemones, starfish, mussels, and barnacles crowd a surf-lathered shore in Barkley Sound off Vancouver Island.



twenty head introduced in 1910—so abound that hunters may bag them year round.

A doe shouldered her fawn off the road the day I left to cross shallow, capricious Hecate Strait, separating the archipelago from the mainland, 50 miles away. As I watched the pair, the thought occurred that perhaps my Wyoming friend had the right idea.

Prince Rupert, mainland terminus of the ferry to the Charlottes, is a fishing center. That fact assailed my nostrils the moment I arrived. Processing plants and fishing gear wafted an unmistakable perfume.

Prince Rupert bills itself as the "Halibut Capital of the World," and from Phyllis Bowman, newspaper editor and local historian, I learned that its fleet lands 85 percent—$40,000,000 worth—of Canada's annual catch, but that its pulp-mill products have a value of $60,000,000 a year. And that with Prince Rupert the Mile Zero of spectacular Yellowhead Highway and the meeting place of popular ferries to Vancouver Island and Alaska, tourism grows in importance.*

I learned from her, too, some offbeat bits about Prince Rupert: That Tsimshian descendants in its population cheer for the Indians at Western movies. That the area's ample rain and fog "just make my hair curly; only visitors and newcomers are bothered by our weather." That local radio stations schedule ten-minute programs that broadcast messages to boatmen and scattered inhabitants of the interior—"such phoned-in items as 'Bill Jones, a chartered plane will fly in for you at 2 p.m.' or 'So-and-so, get in touch with your brother, your father is ill.'"

Bigger Profits but Greater Risks

Rugged men and rugged ships bring Prince Rupert its preeminence in halibut (following pages). I made the acquaintance of such a combination in Bronson Bussey and the *Atli*. With a five-man crew, Bussey fishes off the Queen Charlottes for 10 to 12 days at a time, coming back with as much as 40,000 pounds of halibut iced down in the hold.

"You can make it big in salmon, but you can also starve," he said. "It's risky; halibut fishing is steadier." A halibut crewman, he added, can earn from $5,000 each season to as much as $25,000—"on the biggest of boats in the best of years."

And earn it he does, every penny of it. When the fishing is good, he works from 3:30 a.m. to midnight, baiting hooks or taking fish from 9,000 fathoms—ten miles—of line, often in boat-tossing seas with water running shin-deep on deck. Good food and superstitions buoy him.

"You don't whistle, or, by golly, it'll bring a storm," Bussey said. "Opening a can of milk at the bottom brings bad luck. So does leaving port on Friday. At least that's what they say."

From the deck of the *Queen of Prince Rupert*, the sumptuous ferryboat that runs between its namesake city and the Vancouver Island port of Kelsey Bay, or from a seat on one of the small planes that link the settlements, a traveler is impressed by the emptiness of this part of British Columbia's coast.

"Grease Trail" Led to a Frontier Town

On a flight to Bella Coola in a five-passenger Beaver, we skimmed along winding inlets and hopped low mountain saddles. Green fingers—forests where it looked as if no man had trod—clutched at our wing tips. I found myself scanning the terrain, mentally choosing that sandy beach . . . no, that spot by the waterfall . . . better yet, that jewel of a lake . . . as the place where I would build my dream cabin and get away from the world's rat race.

Bella Coola lies 70 miles inland on a branch of one of British Columbia's longest fiords. Once it was a gateway to goldfields of the Cariboo region. Once it competed with brawling Gastown for the railhead that made Vancouver; again it vied for a line that went to Prince Rupert. Now it sleeps with dreams of what might have been.

A long, green valley slopes eastward out of Bella Coola, forming a pass through the rugged Coast Mountains. Indians followed a "grease trail" along that route; they came to trade for the eulachon fat that was "gravy, butter, and syrup" for coastal tribes. The eulachon, a smelt so oily that when dried it burned like a candle, swarmed in incredible numbers on spring spawning runs.

Down that grease trail also trekked a Scot, not yet 30 when he became the first European to cross the broadness of North America; on a rock near Bella Coola he scrawled an immortal message: "Alexander Mackenzie, from Canada, by land, the twenty-second of July,

*"Alaska's Marine Highway: Ferry Route to the North" was described by W. E. Garrett in the June 1965 NATIONAL GEOGRAPHIC.

one thousand seven hundred and ninety three." Had he arrived a few weeks sooner, he might have met Vancouver, one of whose boats ranged the inlet in June.

Rain clouds menaced the 8,000-foot peaks cradling Bella Coola the evening I wandered the town's few streets. I came at length to an Indian cemetery overgrown with weeds. A lone "mortuary pole" of tribal style raised itself above the thistle and wild rose. Atop its cross board perched a life-size eagle carved from cedar; other totems stared in their fading paint. I looked, and I remembered a tale of death that haunts the valley.

Smallpox that arrived with the white man ravaged Indians here, as in the rest of British Columbia. In one epidemic two white traders went to a village wracked by the disease and —themselves vaccinated—collected blankets that had served as shrouds for the dead. For a tidy profit the traders resold them at another village; 200 more Indians died.

Junior Con Man Claims Potlatch

My thoughts were broken by footsteps. "Hold out your hand," an appealing 10-year-old blurted. I did as he asked, and into my palm he thrust a Canadian penny. He turned as if to go, and impulsively I said, "Wait a minute." Rummaging through my change, I found a U. S. cent.

"Oh, I don't want a penny," the beguiling little con man grinned.

"Well, what do you want?"

"I'll take a quarter because I want to buy a present for a lady."

As the saying goes, I seen he had me, so I gave him the quarter.

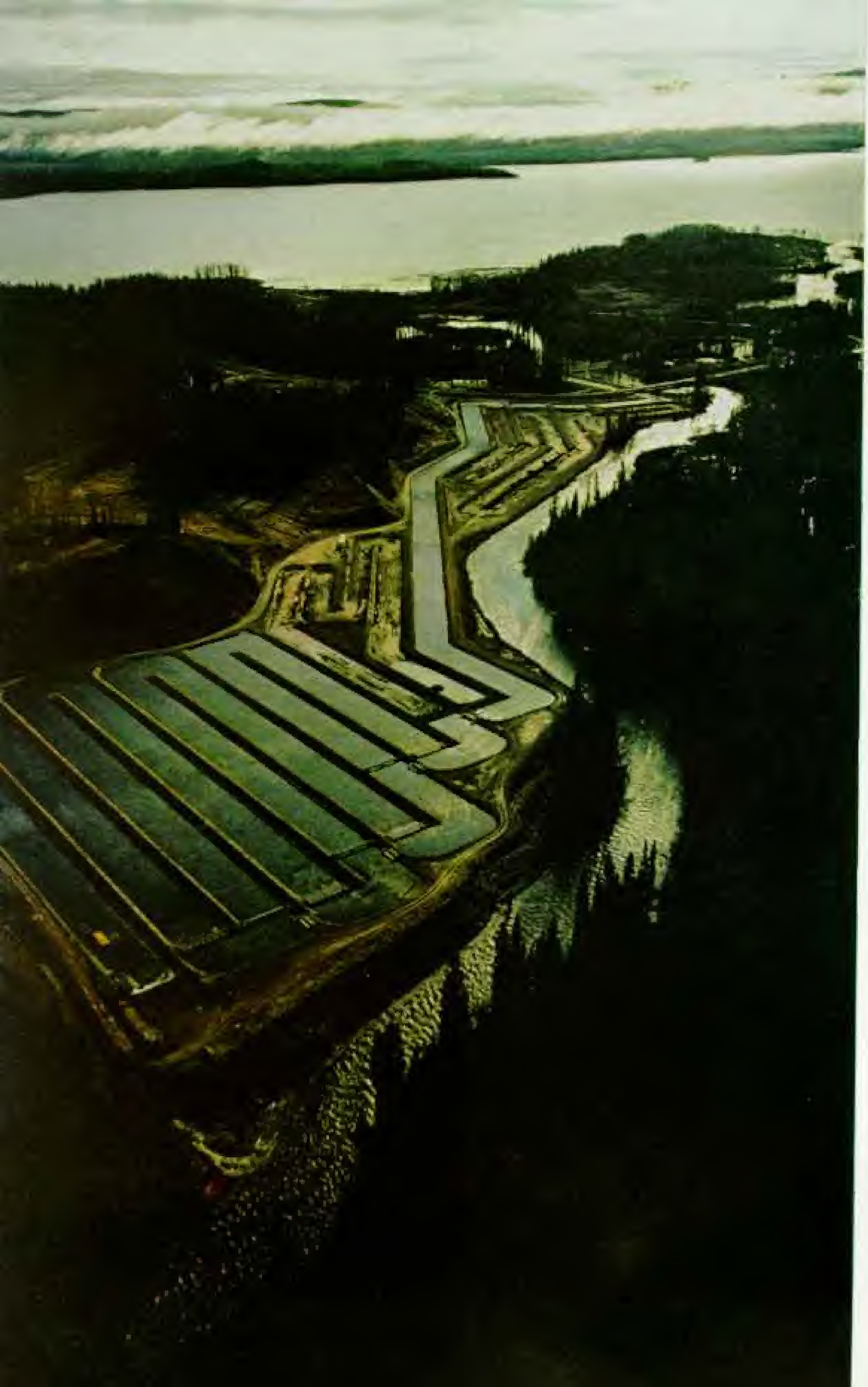
"Potlatch!" he called as he ran off.

I had to laugh. The word in the Chinook jargon of trading days meant "gift," or "giving." It also applied to the ceremonial Indian feasts and distribution of presents by which an individual demonstrated his wealth and enhanced his social standing; often with the gift went an implied challenge to return it, with interest. A law in 1884 banned the practice,



Up comes an octopus, captured for bait in choppy Queen Charlotte Sound. British Columbia's coastal fishing fleet comprises more than 7,000 vessels and 10,000 fishermen. On a good 12-day run a vessel may return with 40,000 pounds of halibut.







Man lends a helping hand when sockeye salmon come home to spawn. The fish find their way across the trackless Pacific to reproduce in native waters, leaping waterfalls and obstructions as they battle their way upstream to the same tributary—perhaps even the same riffle—where they began life years before. On the Fulton River these artificial spawning channels—predator-free, carpeted with fine gravel, and swept by controlled amounts of clean water—are yielding a fourfold increase in the number of salmon hatchlings. In the distance spreads Babine Lake.

Unharmed but marked for life, a baby salmon loses a fin as identification should it survive to return to its Fulton River birthplace to spawn. Fry released from the artificial channels will eventually swim to the Pacific.

Silvery bonanza, salmon taken in Johnstone Strait head for the cannery. Ed Shaughnessy and his son, full-blooded Kwakiutl Indians, work aboard their boat *Porlier Pass*.



along with the staging of native songs and dances. In 1951 the act was repealed. Potlatches now are mild versions of the impoverishing spectacles of old (pages 366-7).

I still was chuckling inwardly over the incident when I dropped in on Dan Schuetze, whose Wilderness Airlines operates a schedule between Bella Coola and Williams Lake—and charter flights anywhere business warrants. He and his fliers are typical of the bush pilots whose skills create aerial highways opening up the vast province.

"Right in Bella Coola you can see what a tremendous difference planes have made," the close-cropped ex-logger said. "Timbering is the big thing here, but most of the nearby areas have been cut over. The logging bases have moved out and if it weren't for planes, families would have moved with them, or else the men would have had to stay in the woods for months at a time—like the old days. But with planes they can come home weekends on green jelly-bean flights."

My raised eyebrows prompted a grin.

"That's when the logger brings home a bag of green jelly beans and scatters them on the green lawn. It keeps the kids busy outside for a couple of minutes while dad says hello to mom in the house."

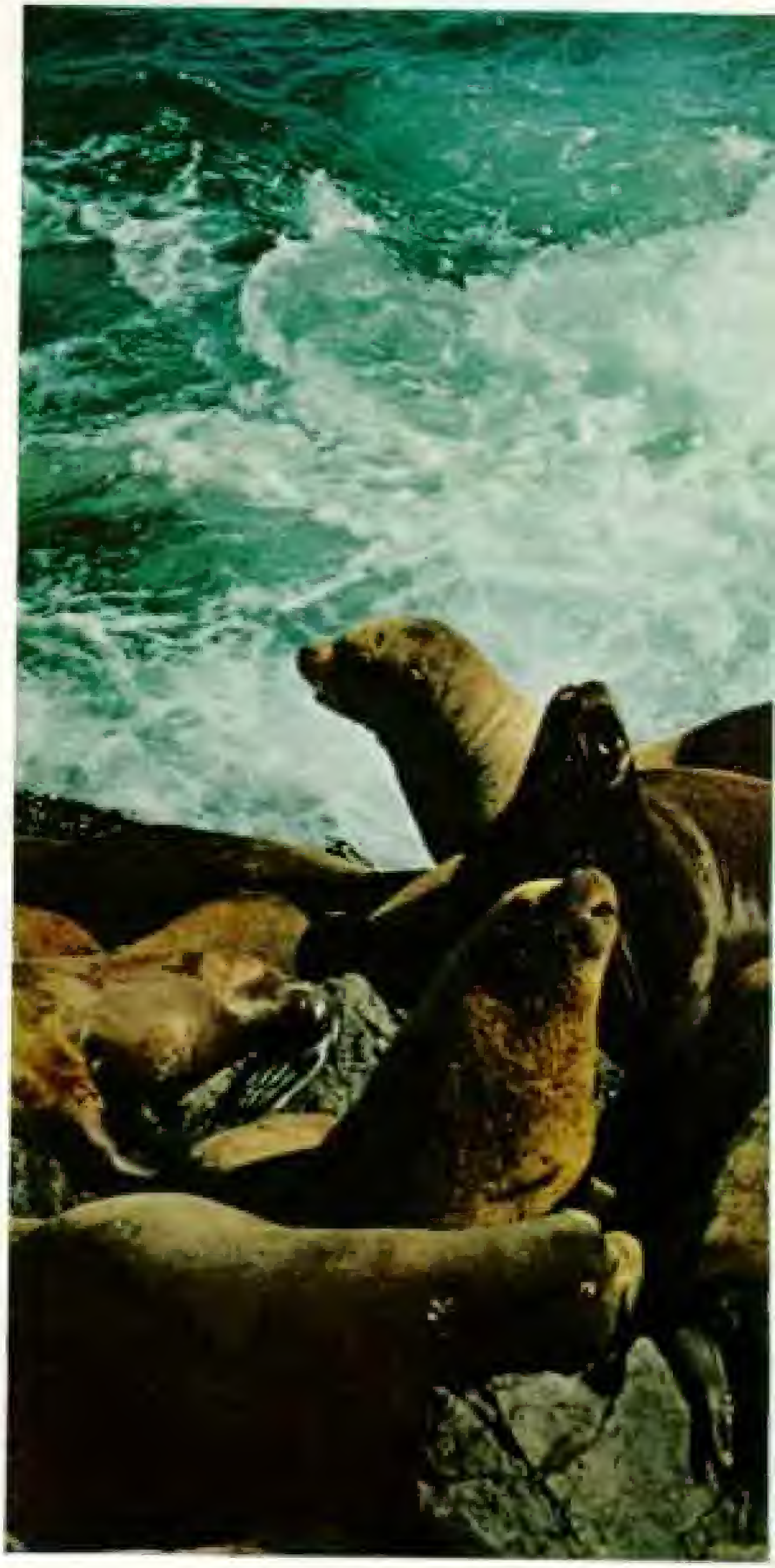
Air Lanes Are Province's Highways

Hardly a spot in British Columbia is inaccessible today to floatplane or helicopter. Bush pilots take sportsmen to virgin lakes, put prospectors down at new locations, fly forest biologists on insect and plant-disease surveys, haul loaves of bread or crates of eggs to a logging camp, or risk their lives in bad weather carrying persons out on mercy flights.

Why do they do it? "Once, in a gale, I flew out a logger with a piece of steel in his eye," Henry Smeets told me. "I had to make three landing attempts before I could put down on Alert Bay and get him to the hospital. But I know I helped save that man's eyesight, and that's reward enough for me."

Mr. Smeets left the Royal Netherlands Air Force to emigrate to Canada and eventually became a bush pilot. As a sideline he bought a floating shack from an Indian, fixed it up, and began flying in sportsmen who wanted the thrill of catching giant Chinook salmon. He approached the owner of a closed-down salmon cannery at Rivers Inlet with an idea for expansion. Now Wilderness Vacations Ltd. operates the converted cannery as a resort lodge for spring and summer fishing and fall hunting.

In a picture-windowed dining room that



Sea lions sun on rocky Folger Island at the entrance to Barkley Sound. Frequenting isolated offshore islets, the animals congregate by the thousands in rookeries each summer.

British Columbians are proud and protective of their unspoiled land and its wealth of wildlife. Raw beauty still graces nearly 17,000 miles of coastline between Washington State and Alaska.

once stored the cannery's fresh fish, I listened to anglers talk of silver beauties landed that day—one topping 63 pounds. There Ian Bell-Irving, the resort's president and also an executive of a fish-packing company, recounted for me factors that caused coastal canneries to turn belly up.

"Seasonal labor became more and more costly. Bigger boats were more efficient. And a small cannery could rarely afford the newest equipment. A pattern of numerous little canneries was economic nonsense. Similar changes forced the closing of a lot of small logging camps.

"As a matter of fact—except for the major centers, and they're growing—fewer people live along the coast of British Columbia today than 30 or 40 years ago," he added.

From the cannery lodge Henry Smeets flew me back to Vancouver for my return home. I feasted my eyes again on the beauties of this coast I had hopscotched. I thought again of the Gold Rivers and the Queen Charlottes and the Rivers Inlets of this vibrant, developing land. And some words of British Columbia writer H. L. McDonald came back: "If you are twenty, be assured of an enviable future. If you are sixty, cry a little." □





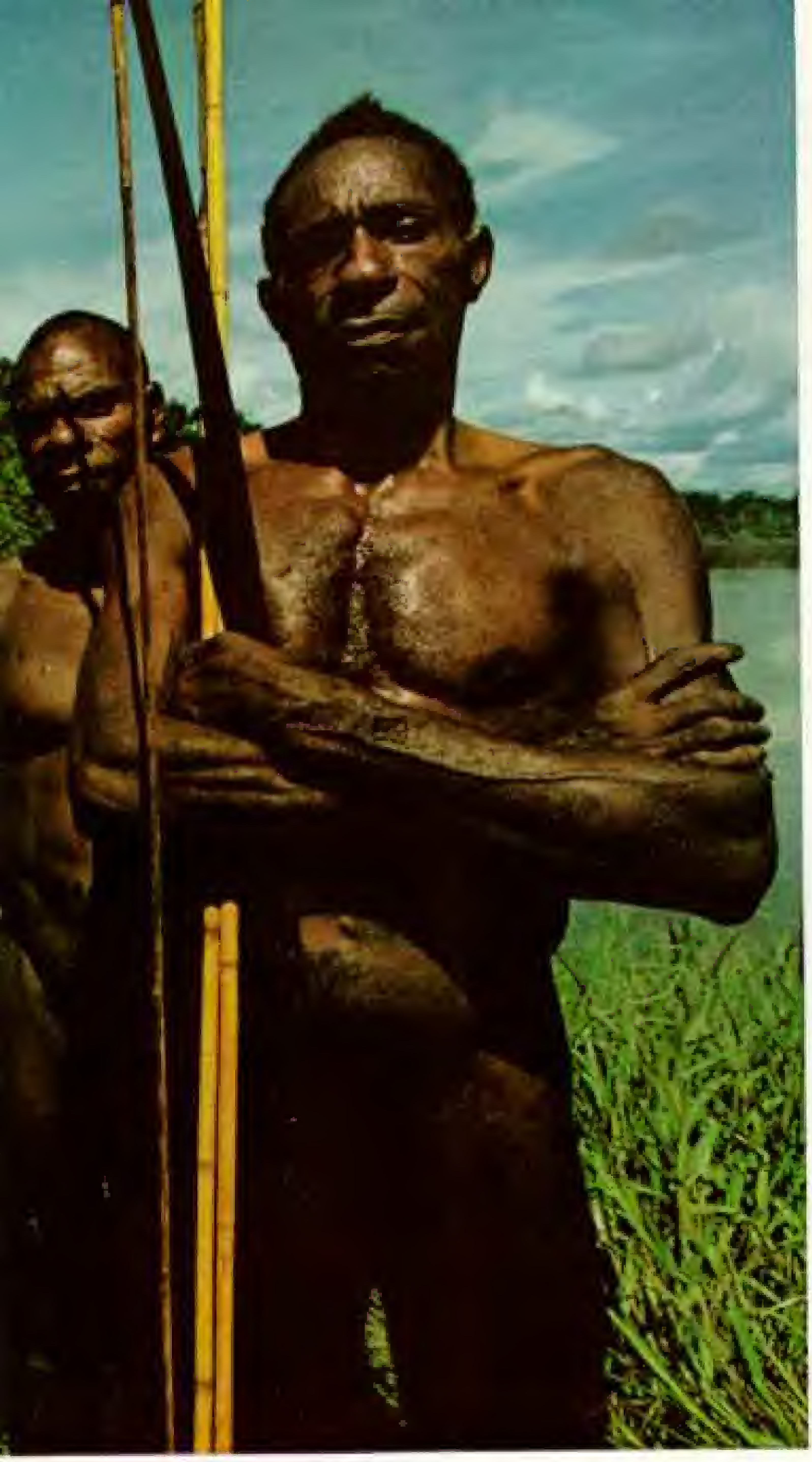
A SCORE OF NAKED WARRIORS stared at us, granite-faced. Some of them spoke urgently in the guttural language of West Irian's Asmat people, but I could not understand.

As I helped my wife Barbara out of our canoe onto the steep bank below Sagopo village, I looked in vain for the chattering women and children who usually come to the landing place to welcome strangers. A single female face, daubed with ocher as for some special occasion, appeared in the doorway of a thatched stilt house. The woman handed a bow and arrows to the warrior leader and then vanished.

The atmosphere disturbed me. The men were tense and uneasy, and the village was unnaturally silent.

"There's something wrong, isn't there?" I asked Dr. Clemens Voorhoeve, our linguist companion.

"Yes, and we'd better get out of here," Bert



THE ASMAT OF NEW GUINEA

Head-hunters in Today's World

ARTICLE AND PHOTOGRAPHS BY
MALCOLM S. KIRK

Uneasy stares greet the author at Sagopo. Headhunters! Only after he left the village did Mr. Kirk learn that Sagopo's people had fled into the forest. These grim, heavily armed warriors are members of a raiding party intent on taking heads. Two wear wrist guards of cane to temper their bowstrings' lash.

Government edict has long outlawed headhunting in New Guinea's West Irian—administered by Indonesia since 1963—but the bloody ritual survives in the Asmat's remotest reaches, still one of earth's least-known regions.

answered tersely. "I'll explain why later."

We shoved off into the shallow, swift Undir River. I started the outboard motor. Quickly it pushed us around a bend and out of sight of the village.

"It sounds unbelievable," said Bert, "but Andreas and Ndep here"—he indicated our nervous guides—"say we walked right into a headhunting raid.

"Everyone we saw was from another village, not Sagopo. The Sagopo people heard

them coming and fled. We did well to get away. Those fellows were nervous and might have attacked us if we had done anything they construed as threatening."

No Headhunting Allowed, but . . .

Officially, headhunting ended at least ten years ago in the Asmat country of West Irian (map, page 382).* Certainly the Indonesian Government and the missionaries have stamped it out in the more accessible areas. But I had seen enough and heard enough to become convinced that in remote parts of the territory's 10,000 square miles of swampy jungle it is still practiced.

The incident at Sagopo strengthened my conviction. So did the events that followed as we made our way upriver to the next village, a place called Ti.

We saw no one on either bank, but we felt we were being watched. Bright-green parrots burst squawking from the jungle ahead of the canoe, frightened by something or someone we did not see. We passed two empty canoes tied to the bank, then a house from which curled a plume of smoke. We waved and shouted greetings. Only the shrill screech of insects answered.

In midafternoon we reached Ti, approaching cautiously and turning the canoe around at the landing so that it pointed downriver, ready for a quick escape. Our precautions were unnecessary; the people fled into the jungle as we came near. Only after considerable coaxing by Ndep, who had relatives among them, would they return.

The first man to come back did a curious thing. From the jungle he brought a pole to which was nailed a tattered, dirty Indonesian flag. This he planted in the middle of the

*John Scofield described a visit to the Asmat in the May 1962 NATIONAL GEOGRAPHIC.





Fear of ghosts drives headhunters to keep grisly relics of ancestors as well as of victims; skulls of both lie scattered about Asmat dwellings. The villager (**above**) uses his trophy as a pillow, believing that it wards off spirits of the dead.

Laid out in rows (**right**), ivory-hued skulls gleam from constant handling. Some still wear lower jaws respectfully lashed in place, befitting the memento of a relative or friend. But those without jaws bespeak a savage ritual: Warriors bake and skin heads taken from enemies before cutting a hole in the temple, shaking out the brain, and eating it. The jaws are then ripped off for neck pendants advertising prowess in war.

village. We surmised that the people believed the flag, probably traded from somewhere downriver, had some magic power and would protect them.

Barbara and I brought out our trading items—knives, axes, tobacco, and fishhooks. We exchanged these things for shields and for the bone and crocodile-jaw daggers the men customarily wore in their armbands. Then we began to take pictures.

Instant Portrait Brings Misgivings

In this remote village, the cameras frightened the people. Barbara tried a Polaroid picture of a young girl. The men, seeing the instant photograph, muttered among themselves. The girl tried to rub her image from the print with a forefinger.

Despite his misgivings, the Ti chief allowed us to take more pictures and to visit the *jeu*, or ceremonial house. In its dim interior we made out a row of fireplaces, and near each we saw a supply of arrows.

The longer we stayed the more uneasy the people became. They seemed relieved when we left. Once back in the canoe, Andreas said something to Bert.

"He says that all the time we were in Ti at least 15 bowmen watched us from the jungle, ready to kill us on signal," Bert told me.

"But why?" I asked.

"Andreas says the Ti people had gone headhunting recently and had killed five people. They thought we might have come to punish them. That's why they ran away at first, then kept us covered."

It wasn't the best day to be on this particular river!

I know of no outsider who has actually seen Asmat headhunters killing their victims. Wherever you travel in this harsh land,

(Continued on page 386)





Feathered paddles churn the Pomatsj River as men from several villages parade in a jubilant reenactment of the return of warriors from a successful



headhunting raid. Stroking furiously, they casually balance dugout canoes so unstable that a Westerner cannot even sit in one without fear of capsizing.

The agony of the Asmat

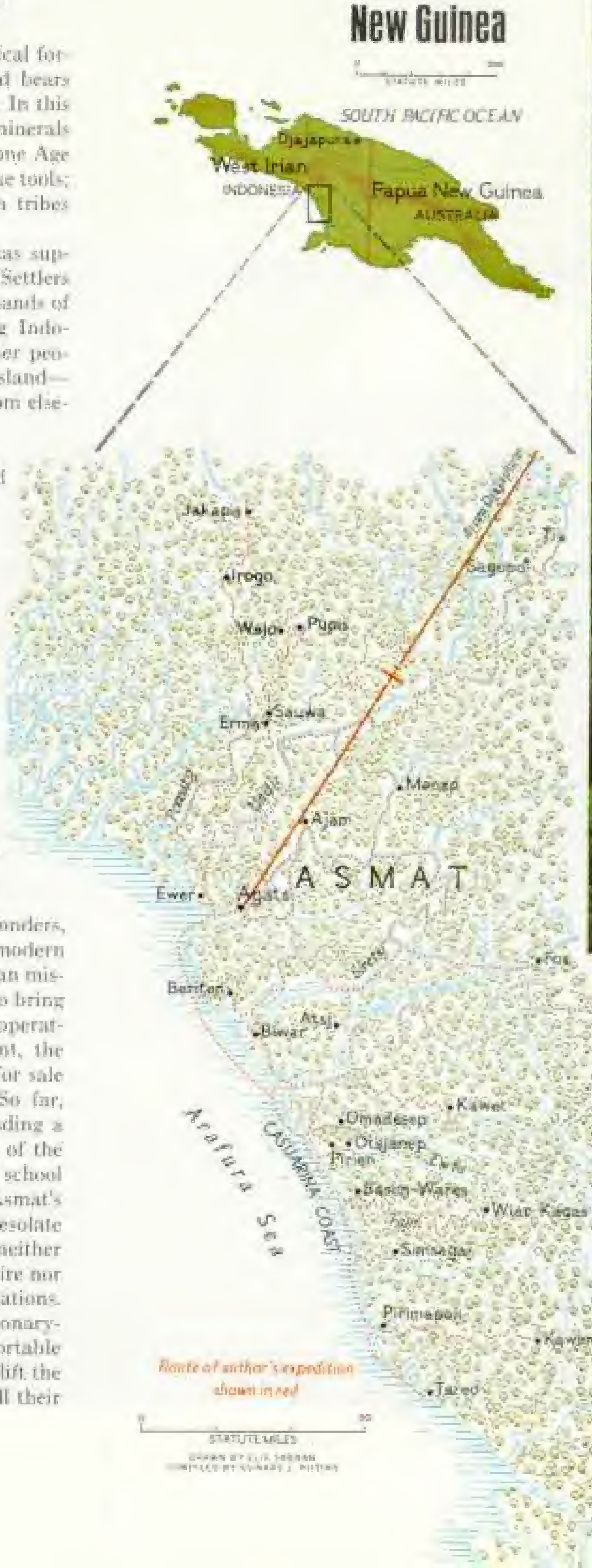
A MOSQUITO-RIDDEN DELTA of tropical forests, great snaky rivers, and mud bears the name Asmat, as do its people. In this area of West Irian no exploitable minerals exist, nor do cash crops grow. Its Stone Age inhabitants lack even the rocks to make tools; for stone axes they must barter with tribes of the interior.

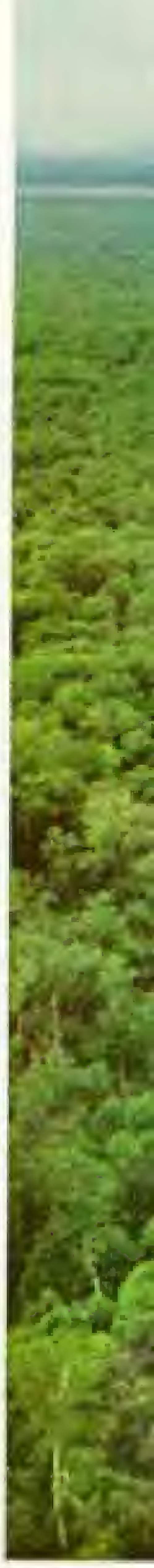
And yet this inhospitable region has supported countless human generations. Settlers came to New Guinea from Asia thousands of years ago across land then bridging Indonesia's scattered stepping-stones. Other peoples reached the 1,500-mile-long island—second in size only to Greenland—from elsewhere in the Pacific.

From the 16th to the 19th century, probes for sea routes and gold quilted New Guinea with the patchwork claims of Spain, the Netherlands, Britain, and Germany. But the Asmat's remoteness, its swamps, and lack of resources effectively discouraged empire builders, explorers, and exploitation; its people continued their primitive, isolated existence.

Control of the Asmat began under the Dutch only a few decades ago, faltered under Japanese occupation in World War II, and then reverted to the Dutch, who held it until Indonesia took over all West Irian in 1963. Australia administers the island's eastern half.

Awed by the West's technological wonders, the people of the Asmat today turn to modern man for assistance. Dutch and American missionaries work with the Indonesians to bring medicine and education to the area. Cooperating with the Indonesian Government, the United Nations purchases Asmat art for sale to museums and private collectors. So far, this program has netted $35,000, funding a trust account that will pay for some of the Asmat's medical, recreational, and school needs. But poverty still darkens the Asmat's future. Few jobs or resources exist. Desolate and unexploitable, Asmat country can neither produce the steel knives its people desire nor trade raw materials to developed nations. Timber, now harvested by a few missionary-organized cooperatives, is its sole exportable raw material. But wood alone cannot lift the people into the modern world, nor will their powerful art (pages 392-3).







Beside a river's elbow, stilted houses of Biwar await the invading Arafura Sea, on the horizon. Sluggish but powerful tides, pushing through brackish, silt-clouded streams, alternately inundate and drain this marshy delta. Rivers provide the only thoroughfares. Water levels may vary by 10 to 20 feet, baring shellfish beds with every ebb.



Stone Age drummer of Pirien village grins to his own rhythms, recorded and played back through earphones by author Malcolm Kirk. Shredded sago-palm leaves decorate his braided hair.





Men make their own fashions at a feast in Basim village, on the Casuarina Coast (map, page 383). Carved pig bone pierces the nose of a guest (**left**); he also wears earrings of woven leaves and plumes of the crowned pigeon. A bamboo chest ornament proclaims that he has taken at least one head.

Charcoal and lime color another celebrator (**below**), wearing a crown of cowrie shells, cockatoo feathers, and the prized fur of the cuscus, a monkey-like marsupial. A third (**bottom**) sports feathers, carved nose bone, and pasty flecks of sago starch.





however, you hear accounts of such raids, and they are so detailed that they could hardly have been invented.

In Sauwa-Erma, a double village straddling the Pomatsj River, we heard an old chief, Takais, describe an attack his people had made some years earlier on the upstream village of Pupis. A crowd of men and boys gathered around as Takais talked. The Reverend Richard Frank, an American Roman Catholic missionary, translated for us.

"The old man is claiming that the raid was called to avenge the killing of an Erma villager by Pupis people," said Father Frank.

"Allied villages were asked to send warriors. They did so, and the party assembled in Erma. While the men painted their canoes with ocher and powdered lime, the women gathered food in anticipation of a victory feast and exhorted the men to fight bravely.

"Then the raiders put on headbands of fur and tied streamers of white feathers to their paddles," Father Frank continued. "They pushed the canoes off and in late afternoon made a rough bivouac a few river bends downstream from Pupis.

"The war chiefs now slipped away into the jungle on reconnaissance."

At this point an old man in Takais's audience came to his feet, picked up a shield, and, crouching low, began creeping around.

"Ah," said Father Frank, "that is Saati,



Shrouded in rattan cone and palm streamers, a Beriten villager bursts ghostlike from the forest at dawn (**right**), terrifying the children. So begins the mask feast, a dramatic illustration of Asmat concern for the spirit world. The boys soon grow bold, approach the mask, and shoot toy arrows at it. Like a shaggy trick-or-treater, the masked man then parades from house to house (**below**) to be appeased with gifts of food.



who was one of the chiefs on the raid. He is reenacting the reconnaissance."

Now Takais resumed the narrative.

"When the leaders came back from their scouting, they split their force into two parties," explained the missionary. "At dawn one slipped through the jungle to take Pupis from the rear. The other went in the canoes to a bend just below the settlement.

Handful of Lime Signals Attack

"Chief Ardji and a few trusted fighters paddled on to the village, coming to it as the people were beginning to stir about and light their fires. Ardji called out that he had no fire and needed an ember to start one."

Suddenly Takais made a throwing motion, and I sensed rising excitement in the group of listeners.

"He is demonstrating how Ardji signaled the attack to begin by throwing lime into the air," Father Frank said.

"Confused and terrified, the people of Pupis rushed to their huts for weapons, but too late. Spears and arrows flew. Men, women, and children were slaughtered indiscriminately. Some forty villagers died.

"Singing triumphantly—'We have killed a man, we have killed a man, we are happy'—the raiders took the corpses to a point near a river junction where spirits inhabit the whirlpools. They dug a shallow trench the



Ritual adoption strengthens village ties





IN AN ELABORATE ceremony, held only on the Casuarina Coast, two neighboring settlements ease their frictions when one adopts people of the other. The once-separate halves of the double village Basim-Wares recently staged such a ritual, the first of its kind in a decade. Three men and three women from Wares—all married—became the adopted "children" of Basim families.

First, women from the adopting homes braid streamers of sago palm into the hair of the six "children" and paint their faces with ocher and lime (**left**). Thin cane strips are looped around their waists and knotted at the navel to a stone axhead—a symbolic umbilical cord (**left, lower**). The "parents" then offer toy bows and arrows to the men; the women, who prepare the meals, receive tongs, used to handle embers and hot stones. All six wear the cane armbands donned by real Asmat children on ceremonial occasions.

Amid dancers and throbbing drums the "children" and their elated "parents" enter a special palm-frond corridor built within the ceremonial house. Basim men stretch out face-down, forming a shoulder-to-shoulder pathway, while the "mothers" stand, legs apart, between them (**right**). As the adoptees crawl through this human tunnel, the women moan as if in labor. Midwives guide the emerging "children" and open their eyes.

At this, the proud "fathers" ecstatically announce to the village the sex, health, and ease of birth of each of the "children."





length of a man. Dragging each body through the trench, the warriors shouted: 'There's no need for you to attack us again. We've revenged our dead now, so let's live in peace.'

"The raiders cut off the victims' heads and limbs with bamboo knives and brought the dismembered bodies to Erma. The women accompanied their husbands and the bodies into the ceremonial house, where witnesses related how each head was taken.

"Then the heads were baked and the skin removed. The brains, shaken out through a hole cut in the temple, were eaten. The lower jaw was severed and worn on a necklace."

Missing Jaw Denotes Violent Death

In the Asmat, a skull with a hole in the temple and the lower jaw missing is invariably the trophy of a headhunting raid. The skulls of those who have died natural deaths are never holed, and the lower jaws are always attached (pages 378-9); both are used as pillows, and are also worn occasionally to ward off the spirits of their original owners.

Twice during our stay in the Asmat we saw obviously fresh skulls with pierced temples and no lower jaws. Once a man offered to trade me a human skull, quite fresh, for a jungle knife. At several places, men who possessed trophy skulls also wore human vertebrae on necklaces (page 394), and explained that the vertebrae had belonged to the men from whom they had taken the skulls.

Despite Indonesia's efforts, the grisly practice of headhunting is by no means dead.

As we traveled about the Asmat (the name, incidentally, refers both to the region and to its 20,000 or so inhabitants), we were given invaluable assistance by missionaries, especially the Crosier Fathers.* It was a single-engine missionary plane, in fact, that had brought us from the West Irian capital of Djajapura to Agats, administrative center of the Asmat. From it we had our first look at the broccoli-like jungle and looping brown rivers of that vast swamp, where streams from 15,000-foot mountains meet tidewater flowing as much as 40 miles inland from the sea (pages 382-3).

Water governs the day-to-day life of the Asmat people and provides their only thoroughfares. Barbara, Bert, and I took to the rivers in the manner of the natives, exploring backwaters and byways by dugout canoe powered by a sturdy outboard. Like the natives, we took our chances with crocodiles. One, by actual count, had killed 54 people, dragging some of them from their boats.

Asmat villages always stand by a waterway, the houses raised on poles above the mud. At high tide, the rivers overflow and inundate the forest. At low, the receding waters leave broad expanses of dark mud in which people grub for shellfish. Seafood is an important part of the Asmat diet. So are lizards, pigs, and cassowaries—wild flightless birds almost as large as ostriches.

Palm Provides Both "Bread" and "Meat"

But the major food of these people is the starch of the sago palm, which is eaten roasted. We went one day with an Asmat family to watch them prepare it.

We paddled far into the swamp, where the sago grows best, and landed in a tangle of mangrove roots. Otor, our host, selected a tall palm and felled it with his ax. The men then chopped the trunk into sections. Otor's family pounded the pith into a dry pulp, which they mixed with water and strained to separate the fiber from the starch. Lumps of the white, flourlike residue were roasted until they became crusty on the outside. The family ate the crusts and roasted the lumps over and over until nothing was left.

From the sago palm comes also the great Asmat delicacy, the sago grub, which is the soft white larva of the capricorn beetle. The

*See "New Guinea's Fierce Asmat: A Heritage of Headhunting," by Father Alphonse Sowada, head of the Crosier Mission, in *Vanishing Peoples of the Earth*, a National Geographic Special Publication, 1968.

Feigning the sleep of the newborn, two Wares "daughters" rock in the arms of Basim tribesmen after their ceremonial rebirth. Soon they will rise to feed men from both halves of the village, demonstrating the younger generation's dual allegiance. The juvenile roles continue for several days. Pretending childish innocence, the men learn anew to hunt and the women to fish; both play games with the village's youngsters. All six then return to their original homes and families but remain living links uniting Basim and Wares.



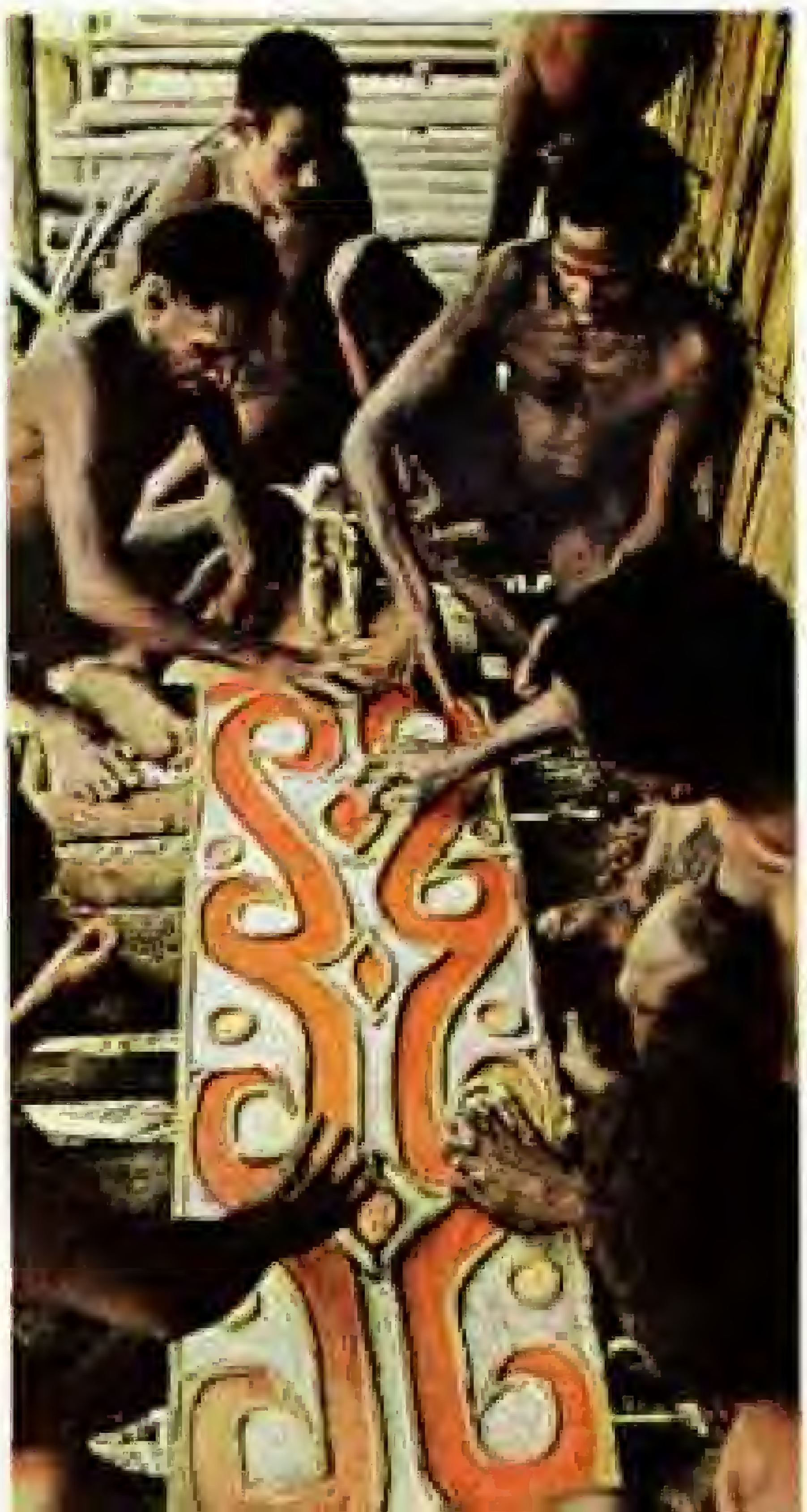
Images of the dead represent villagers killed by enemy warriors. Sculptors work in the bark-floored *jeu*, a ceremonial house traditionally tied to headhunting rituals. They may spend weeks on each *bis* pole, carved from a tree trunk and its flat buttress root. Steel tools increasingly replace those of shell and stone.



Picture books of Asmat culture, carvings serve both as art and as ideograms for a people who lack written language. Openwork images (below) jut from a war canoe's prow in remembrance of ancestors. Paddles and spears bear similar motifs, often including stylizations of cuscuses, praying mantises, and other creatures.



Abstract pig tusks curl across a shield that villagers daub with ocher and lime (below). Hacked from a broad root, each shield is named for a departed relative. The Indonesian Government discourages the making of jeus and bis poles, in the belief that they encourage the Asmat to perpetuate headhunting.



Painted and erected outside the jeu, such effigies traditionally stand amid warriors and their wives in dances that precede pay-back raids on offending villages.

people actually raise these. They fell a tree and cut holes in the trunk to let the beetles in. The beetles lay their eggs, the eggs hatch into grubs, and the villagers collect them after about six weeks, when they are a couple of inches long (page 403).

We often watched our hosts roast grubs on bamboo slivers. I tried to eat one, but couldn't bring myself to swallow it.

A complex culture has evolved over generations in this humid region. We heard much about it from the Reverend Gerard Zegwaard, a missionary who went into the Asmat in 1950.

"The Asmat equates a human with a tree," Father Zegwaard explained to us in Djakarta, Indonesia's capital, where he now works. "His legs are the roots, his torso the trunk, his arms the branches, and his head the fruit."

In certain parts of the Asmat, he said, a freshly severed head—the fruit—was needed to initiate a boy into manhood. The boy sat with the head between his thighs, and its power was transferred magically to him. Then the boy was paddled out to sea by male relatives, in the direction of the setting sun where the spirits of all ancestors go.

Playing the role of an old man, the boy pretended to grow weaker and eventually feigned death. An uncle immersed him in the sea, and the boy was ritually reborn.

"On the return journey," Father Zegwaard continued, "the boy slowly came to life and was taught the names of trees, animals, and rivers as they went past. Back at the village,





Human vertebrae decorate the bamboo-and-cassowary-quill pendant of an Asmat warrior (**above**); all attest his past as a headhunter. "Moustache" of sand-polished shell loops from another man's nostrils (**right**).

he was given the name of the victim, whose power he assumed.

"So you see, in a sense there had to be death for life to continue."

Carving of Poles Foretells Revenge

The government campaign against headhunting has included the destruction of many jeus, the ceremonial houses of Asmat villages. Indonesian officials are well aware that the planning of raids takes place in them. Unfortunately, however, they have other uses. The jeu is a men's social and cultural house, as well as a bachelor quarters. Wherever these structures have been burned by the government, they are sorely missed.

In addition to destroying the houses, the government has tried to stop the carving of *bis* poles (pages 392-3), which are also closely associated with headhunting. But in a few Asmat villages that have escaped government surveillance, one can still find the ceremonial houses and the poles.

Sculptured from whole tree trunks, a bis represents kinsmen slain by enemy warriors. Every bis I have seen commemorates at least two people, which says something about the deadliness of local warfare among the Asmat. Once finished, bis poles become the focus of ceremonies that traditionally are followed by raids of revenge upon those who have killed the bis owners' kinsmen.

At Pirien, a village we reached from the sea after pushing our canoe over barricades of

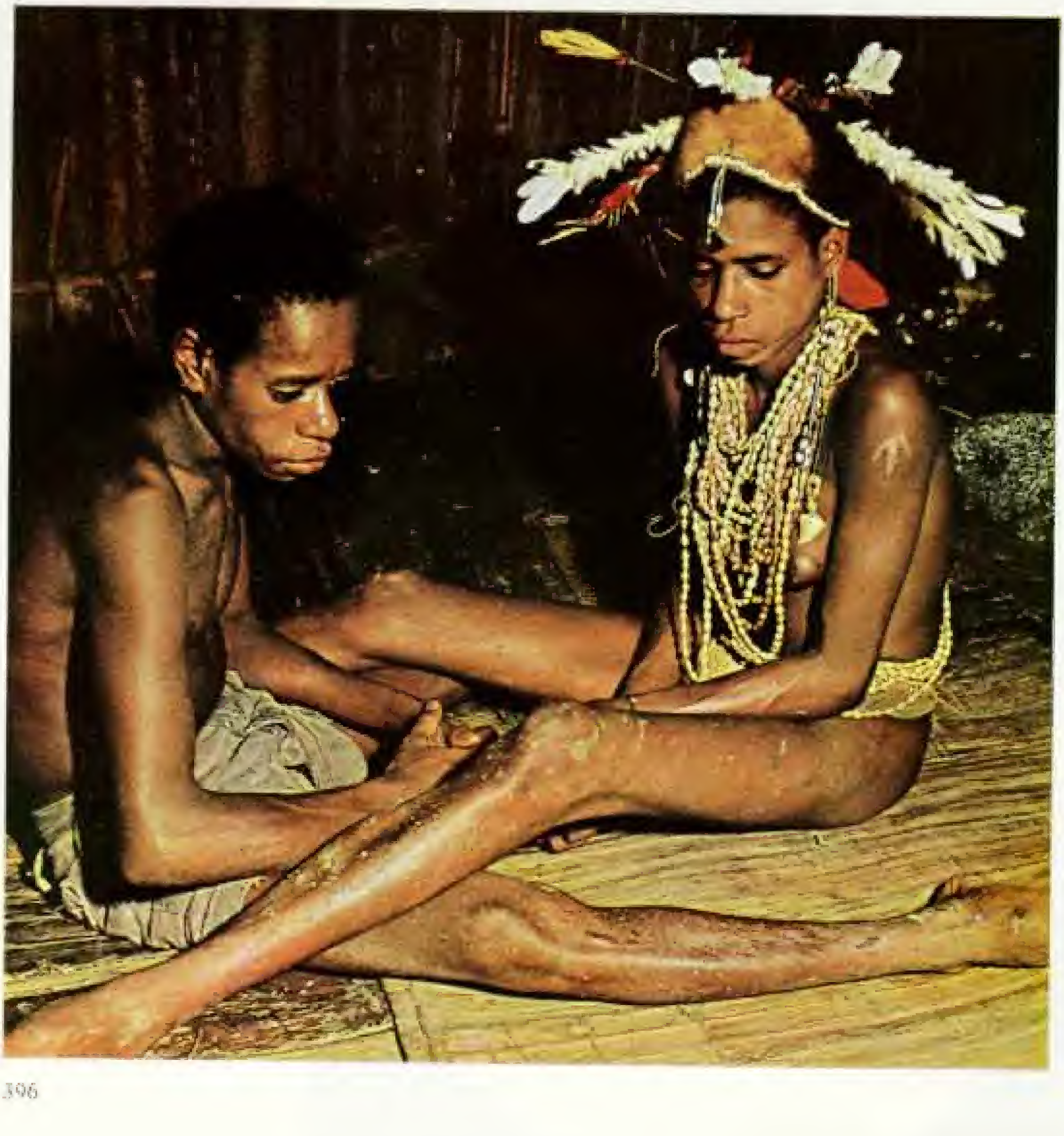




Dog-tooth necklace, furry bonnet, and bamboo chest ornaments festoon a lime-striped dancer (**above**). Borrowed from her headhunting husband, the decorations enhance her appearance at a feast in Basim village.







logs placed across the Ewta River, we found men working on no less than five bis poles. Pirien, we knew, had recently fought with Otsjanep, a village a short distance upstream, and supposedly had slaughtered the Otsjanep war chiefs.

Did the carving of the forbidden bis presage a further attack upon Otsjanep by the people of Pirien? We could not tell. We had noticed that the people of Otsjanep seemed afraid to come downstream past Pirien. But the men wielding their crude chisels were gay, cheerful, and apparently at peace with all the world.

Adoption Ritual Unites Communities

In Basim-Wares, a double village several miles south of Otsjanep, we witnessed the colorful *tasor jiwi*—literally, "adopted children"—a ritual unique today to the Casuarina Coast, or southern half of the Asmat shore. Adults play the role of children in this adoption feast, which has evolved over the years to smooth tensions between neighboring villages (pages 388-90).

I, too, became an adopted citizen of Basim-Wares, through a simple little ceremony in which I pretended to suckle the wife of my new "father," a chief named Betakam. I suspect he wanted me in his family mainly because I possessed a supply of trade goods —knives, tobacco, and fishhooks.

In the village of Erma, Barbara was adopted by the war chief Saati, who explained that she reminded him of his dead sister. Saati gave my wife a new name: Bonap. It meant "same face."

Bert noticed a scar on Saati's calf and asked him how he got it. A gleam flickered in the old warrior's eyes, and he jabbed a clawlike finger into Bert's chest. He repeated one word —unintelligible to us—over and over, and then raised his arms as if looking down the sights of an imaginary rifle.

"He is telling you it was the Japanese during the war who caused the scar," Father Frank explained. "The soldiers came up the Pomatsj River here. A bullet passed through Saati's leg."

Saati was prouder, though, of two other scars, arrow wounds on his right thigh and left bicep. "Wejo," he said; this was the name of an upstream village against which he once led an attack.

"And what about these?" Bert asked, drawing attention to two scars on Saati's buttocks.

"Pupis," Saati said, referring to the raid Takais had described to us.

"In the bottom?" Bert queried. "They must have got you as you were running away! You're a coward," he teased.

"No! No!" Saati shouted indignantly. "I was caught by surprise."

Though warfare is closely linked with religion, marriage and birth are secular affairs in the Asmat. Birth occurs in the family home, with older women attending the mother. The father, with a heroic display of indifference, wanders off to chat with friends.

Marriages generally are arranged by parents, with the wealth and prestige of each family well in mind (opposite). If the girl refuses to wed the selected boy, her parents plead with her and beat her until she agrees. On rare occasions a girl and boy elope.

Sorrow Takes a Dramatic Turn

Death to the Asmat is an excuse for drama. One day as Barbara and I arrived at Omadesep village, we heard loud wailing. Outside a house overflowing with mourning villagers, we learned that its owner, Doupak, had just died of flu. His wives and other relatives were overcome with sorrow.

Several women rolled in mud patches beside the house (following pages). Some lay prostrate on their stomachs, rose to their knees, and then fell again. Two women hugged each other in grief. Another repeatedly stabbed the ground with a short dagger.

Suddenly, in the midst of this chaos, a handful of men emerged from the house, bearing the body of the dead man on their shoulders. We watched from the shore as the

Mock gloom marks an Asmat wedding. The bride's mother wails at losing her daughter; the bridegroom makes a symbolic dash for freedom, ending in his capture and sullen return (**upper left**). Haloed in feathers and cuscus fur, his unsmiling bride-to-be rides an uncle's shoulders to the house of the groom's parents (**upper right**). Face-to-face, both teen-age partners feign dejection, then whisper each other's name to the uncle. His wish for mutual happiness completes the ritual.







villagers paddled or swam across the river to a coconut grove on the opposite bank. There they buried the body. In earlier times they would simply have placed the corpse on a platform to rot.

Sometimes the Asmat begin mourning before the subject is truly dead. In Basim, the Reverend Anthony van de Wouw told us about a man who was dying when the villagers rushed into his house to wail over him.

"They suffocated the poor fellow," the missionary told us.

In another case, an old woman collapsed and was placed on a platform in front of her house, in which the family gathered and loudly proclaimed their grief. "The people got a frightful shock when the woman walked into the house, demanding to know what was going on. Apparently she had only fainted," Father van de Wouw said.

"Everyone is still a little wary of her. She was here today, incidentally, to tell me how strong she is while everybody else has flu."

Brother's Death Doubles Responsibilities

One morning, Father van de Wouw led us to a typical family dwelling. The owner, Wek, and his two wives greeted us from their veranda, eight feet above the ground. Then Wek helped us climb a notched pole to the entrance, one of four openings in the house.

As we stood on the veranda, Father van de Wouw explained: "The wife on Wek's left belonged to his brother before he died. In accordance with custom, Wek will look after her and her children. His brother also was head of this house, so Wek has taken on that responsibility, too. Six related families live here now, and the house is called Wek's *tu*—canoe."

We ducked our heads and entered the open doorway. The only light inside the 30-by-60-foot structure came from the entrances and from chinks in the thatched roof and bark-covered floor (page 409).

"Each of the fireplaces here belongs to one family," Father van de Wouw said.

"In the old days, these houses were much longer, with as many as 16 fireplaces. Now the government tries to persuade the people to build individual family homes. I don't agree with that policy.

"For one thing, it takes too long for one family to build a house; the able-bodied members have to go out almost every day to get food, and have little time left for building. What's more, the house must be rebuilt every

Mourning the husband they shared, widows of Omadesep squirm through Asmat mud (**above**). The ritual is intended not only to display anguish but also to mask the women's scent from his ghost. Other mourners plastered their shaved heads with red clay and stabbed the ground with bone daggers.

Until recently, a man's body was left to decay on a platform, amid his broken weapons. Relatives later retrieved the skull. Missionaries now influence most villagers to bury their dead, heads intact, in bark mats (**left**).

four or five years because it rots so quickly."

"I wonder if there isn't another advantage," Barbara said. "Parents can leave their babies to play together, knowing that older people in the house can look after them."

As we stood talking, a man lying near a wall shifted his pillow. It was a skull, and, like others scattered around the room, it had a lower jaw. Its nose and eye sockets were decorated with red and gray seeds.

"Skulls of relatives," explained Father van de Wouw. "The Asmat have a dreadful fear of ghosts. But if you keep a man's skull nearby, it will protect you from his spirit!"

Sleeping with a collection of skulls may sound unnerving, but Barbara, Bert, and I, who passed many nights in Asmat villages, soon became accustomed to it. Also, we carried small, easily erected tents. They were a great protection against mosquitoes in a malarial land, and once we had zippered the doors shut, we could see no skulls.

Usually we set up the tents inside the empty guesthouses to which we were escorted with cries of welcome. Astonished villagers passed the word: The strangers build houses inside houses. Everyone pressed to look, and usually we had more visitors than the house could comfortably contain.

Peace Leaves Men in Idle Ease

In many an Asmat family, women gather most of the food and do the cooking. The men guard them while they are working, although in these days of comparative peace, some husbands are inclined to stay home and talk while the wives go off to work.

Near the coastal village of Omadesep, however, Barbara and I came across a strong guard of warriors keeping an eye on their women who were fishing a short distance from shore. Traditional enemies of the villagers, we gathered, lived nearby.

Some of the men paddled us out to join the fisherwomen. Up to their waists in the water, these had formed into two lines, shaped like a V, that moved together and trapped the fish between them. Then the women scooped out the frightened quarry with nets of woven fibers (pages 402-3). It appeared to be hard work. Did the men help in any way? Not at all. They merely watched.

"It's plain to see the Asmat is a man's world," Barbara remarked, as we described our canoe trip to Father van de Wouw.

"Yes and no," said the priest. "On the one hand, there is the case of a man I know who was being harangued by one of his wives. Quite casually he picked up his canoe paddle and speared her dead with the pointed handle.

"On the other hand," he continued, "it is not unusual to see a fierce-looking warrior tenderly holding the hand of a wife who had married him because the parents of the couple had arranged the union!"

Women's Magic Fails—or Did It?

During certain feasts, women traditionally attack their husbands. We happened upon one such ritual, prelude to a mask feast in Beriten village, and watched with amazement as the ladies, armed with bone daggers, fish harpoons, and sticks, chased their menfolk about. They used their weapons vigorously, drawing blood on backs and arms. The men did not retaliate in any way.

A bit later, we watched a delegation of men making the rounds of the houses and begging the women not to let it rain the day of the mask feast. The Asmat are convinced that their women can work magic, a power they greatly fear.

I don't know what the women replied, or what they did, but early in the morning a veritable cloudburst awakened us.

"Hah!" I snorted. "Women's magic!"

"You don't understand," retorted my wife. "They deliberately made it rain to show the men who were the real bosses."

But the men had the last word. In the middle of the pouring rain they ran out on their verandas and pounded on the walls of the

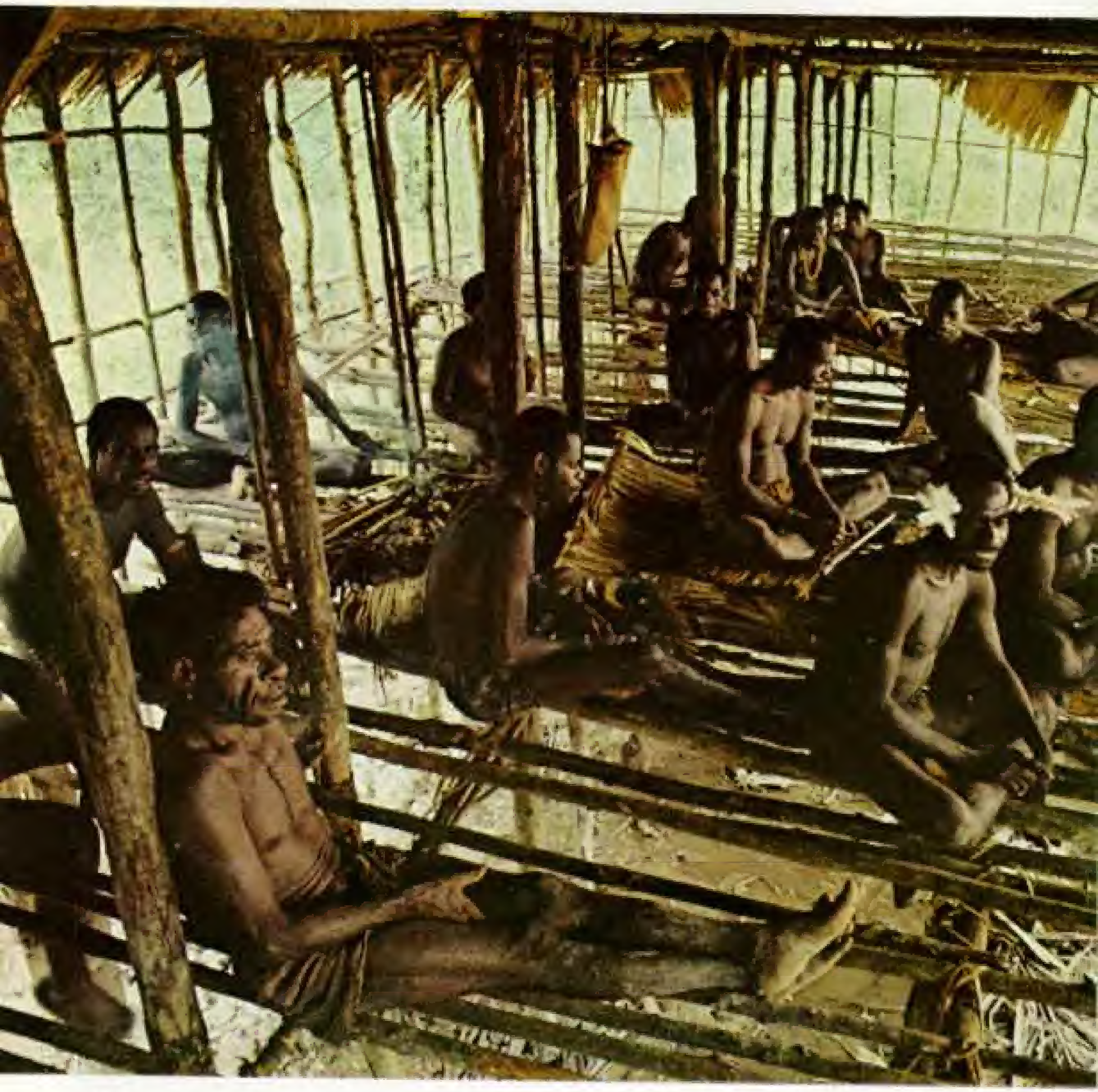
Gift to keep the peace, an orphan from nearby Yaptambor village nestles in the arms of his new father in Basim-Wares; a palm-frond poncho protects both from a jungle downpour. Years ago, Yaptambor warriors killed this man's son in a raid. To make amends, they recently offered him the boy. Now, if trouble flares again between the two villages, the boy could serve as emissary to Yaptambor without fear of being killed. Missionaries increasingly promote such peaceable alternatives that seek to stop the savagery of headhunting without destroying Asmat culture.

BARBARA RYAN



Women work while men relax. On Asmat fishing expeditions, wives wade waist-deep in a V, then scissor together, scooping up their quarry with hoop nets of woven fiber (**right**). Husbands chat atop the slats of a flimsy shelter (**below**). Asmat men traditionally guard their women from raiders. But as security has come to many coastal villages, the menfolk do little more on fishing trips than loaf.





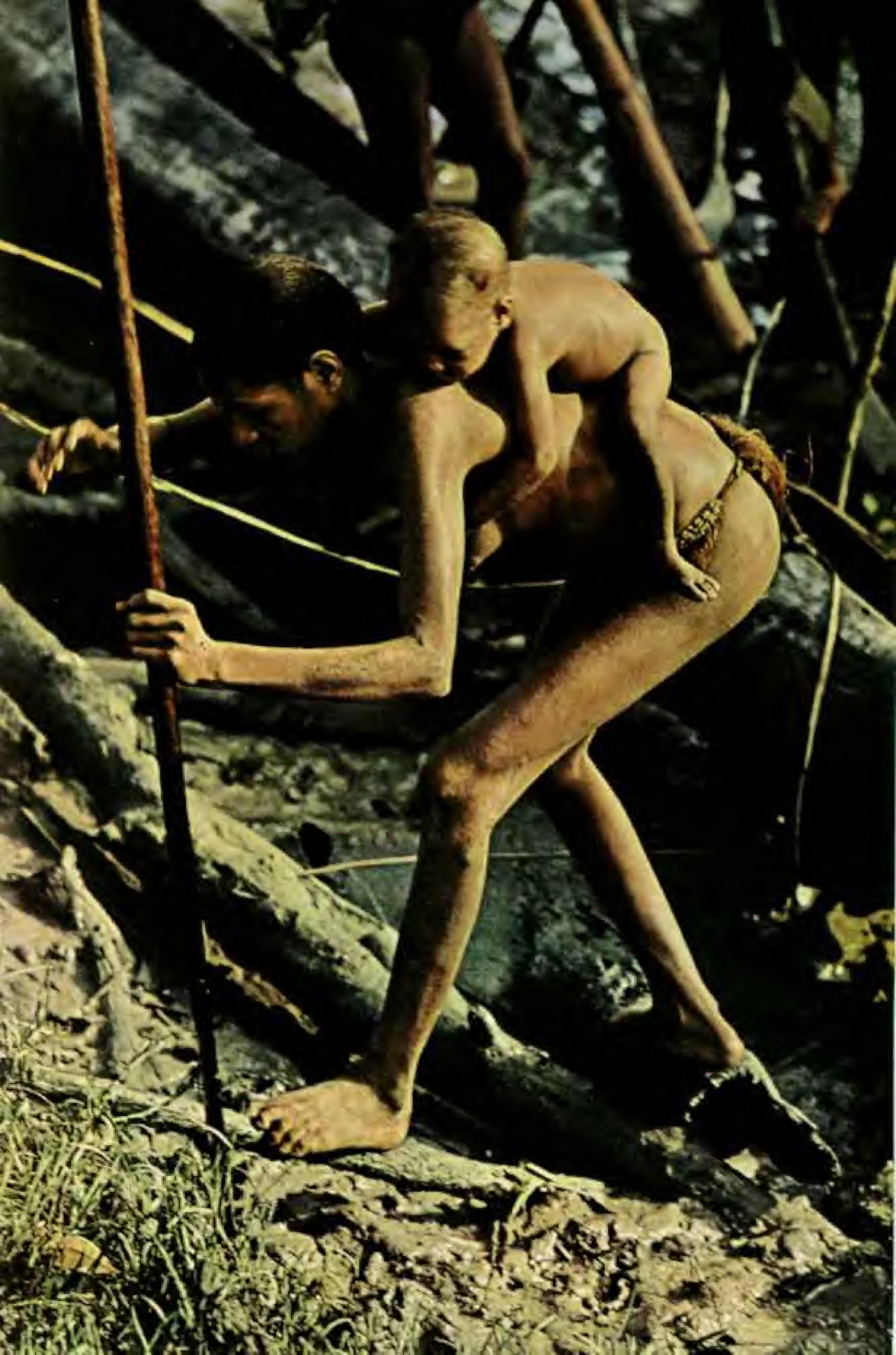




Palm-frond packet teems with another Asmat food—squirming sago grubs, the larvae of capricorn beetles (**below**). Men fell sago palms and bore holes in them to make attractive nesting sites for the beetles, which lay their eggs within. The villagers return about six weeks later and harvest dozens of grubs from each trunk. A prized delicacy, the larvae are skewered and roasted.

Even more important to the diet of the Asmat is sago itself, a starch taken from the trunk of the tree. Each family claims a private sago swamp where the men cut and split the thorny palms; they and their mates pound and wash the pith to produce a white, doughy starch that they carry home in leaf wrappers. Asmat diners roast lumps of sago, eat the crust, and return the raw centers to the fire for another charring.





houses with sticks and clubs. The racket either frightened the rainstorm away or scared the women into revoking their spell. In any case, the sun came out and the party went on as scheduled.

Three Asmat had donned all-enveloping costumes made of rattan and palm frond—masks, I suppose you might call them, for they covered their wearers' faces as they did their entire bodies. We were told that two of them represented the spirits of villagers killed in fights; these spirits were paying their final visits to their earthly homes.

The third figure—the *bunmar*, or orphan—was pursued through the village by brave youngsters who tossed toy spears. Later, after invited guests from other villages joined the feast, that spirit and the two others pranced about amid drumming, dancing, and wild excitement (pages 386-7).

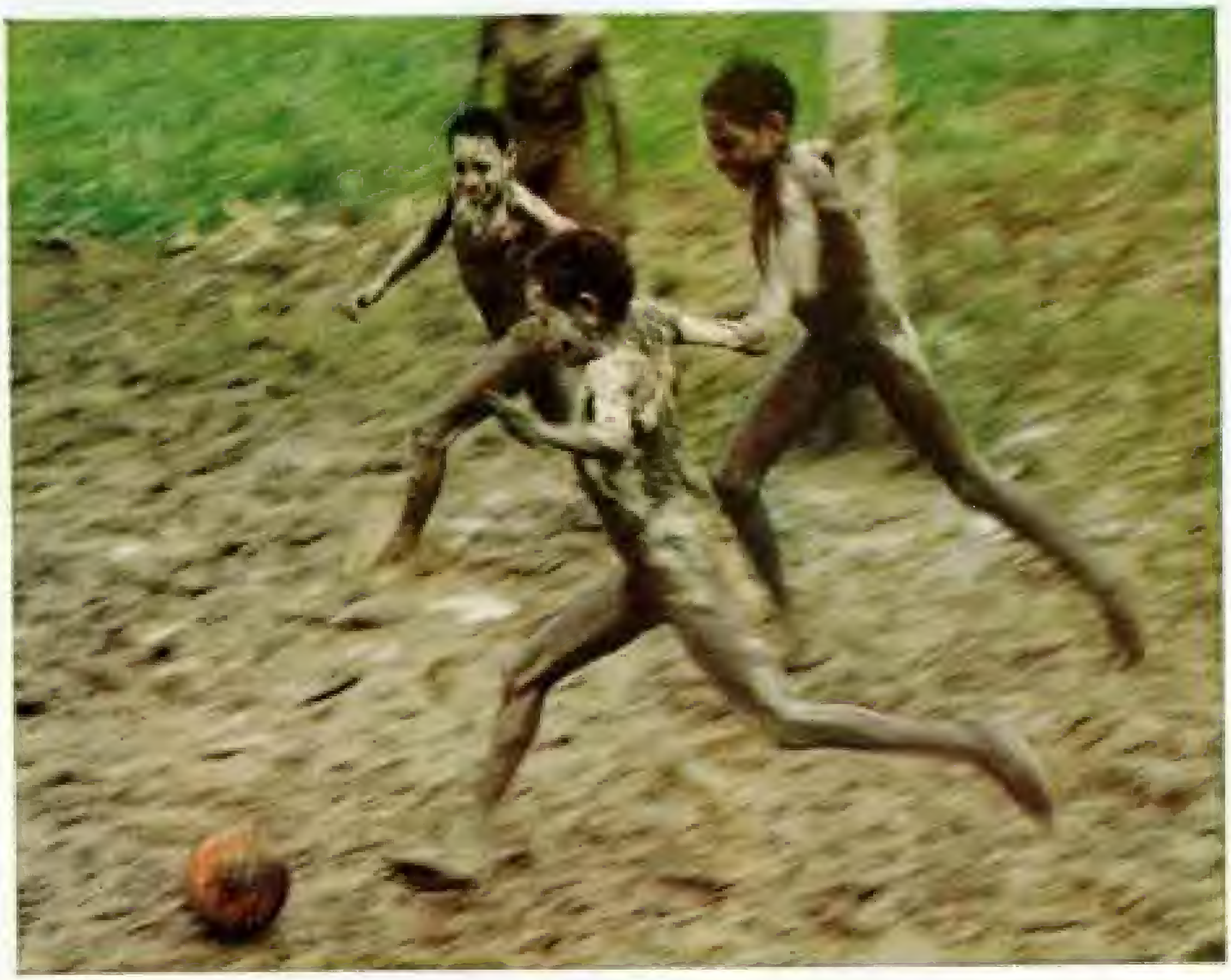
New missionary and government schools have tried to teach the children that the old ceremonies are only superstition and not to be taken seriously. In this they have not been successful. I am sure that the little boys of Beriten who chased the masks believed them to be real spirits.

Success Breeds New Difficulties

Also, the new schools have given rise to new problems. The Reverend Delmar Hesch, a boyish-looking missionary who had lived in the Asmat longer than any other Crosier father, spoke of them at his mission in Ajam.

"Ajam has 1,000 people, and I think it's the most progressive village in the Asmat," he said. "We have the most successful cooperative and one of the best schools. At first everyone was enthusiastic about the new institutions—too enthusiastic, it now appears, for the people expected too much. Perhaps we misled them.

"Take the case of the children. The government insists they go to school through grade



Tiny rider clings monkey-like to his mother's back as she returns from her sago grounds (**left**). Unlike Western children, young Asmat soon develop such tenacity. This one frees mother's hands for a balancing act atop logs laid across the mire.

BARBARA KIRK

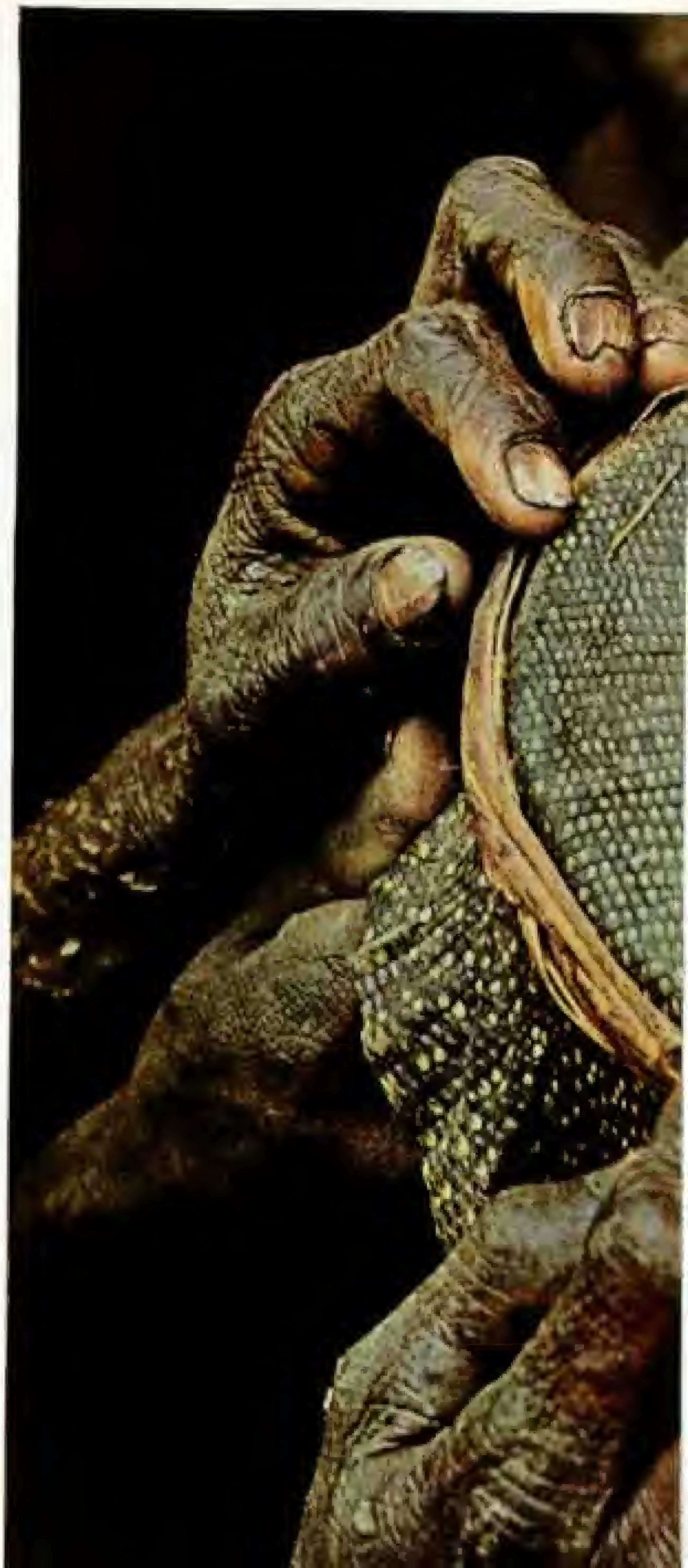
Clothed only in mud, boys of Erma village pursue a soccer ball (**above**). Schools presage a new life for the young. But education can lead to disappointment—many youths struggle with the three R's, then find the Asmat offers no suitable jobs.





Human blood binds

ESSENTIAL to nearly all Asmat ceremonies, drums take form from easily available materials. Using fire and sharpened sticks, the craftsman patiently fashions a softwood log into a hollow hourglass shape, with a handle and decorative symbols sculptured on the sides. A volunteer—in this case



lizard skin to jungle drums

the drum maker—donates blood from small incisions in his leg (**left**). Collected in clamshells, his contribution is mixed with crushed and baked seashell to make a permanent, thick glue that he smears around the instrument's rim (**lower left**). Friends then help him stretch lizard skin over the drum (**below**). Doubly secured by a rattan hoop, the drumhead is placed near a fire to shrink; it is later finely tuned with knobs of beeswax to produce a uniform monotone. Drumskins quickly sag in the humid air but are just as speedily retuned with heat and more wax.



six, although I think grade three is far enough at the present time. So the children come out of school proud of their ability to read and write and do sums, and they want jobs in which they can use their skills. There are very few such jobs in all the Asmat.

"Refusing to work with their hands, the children just hang around the village, creating all sorts of problems for their parents. It is a sad thing."

Wartime Plenty Brings a Strange Response

As for the grown men, Father Hesch continued, the cooperative helps to take their minds off headhunting and provides them with a few luxuries.

"But again, more was expected and didn't materialize. The men waited and waited. Finally their patience was exhausted, and at this point they were ready for a peculiarly South Pacific phenomenon, the cargo cult."

The profligacies of World War II tremendously furthered the spread of cargo cults. Primitive people, some of whom had never seen an outsider, looked on in amazement as ships and airplanes disgorged food, clothing, terrifying firearms, all sorts of things for which they quickly developed a desire.

In New Guinea, villagers sometimes carved rough landing fields out of the jungle and waited for the great birds to fly to them with gifts. That was all the white strangers did, the people thought, except possibly to sit around and make marks on paper.

We once saw a cargo-cult landing field with a replica of a radio aerial built beside it; real airfields had such things, it was reasoned, so they must be necessary.

Inevitably, cult leaders arose who promised the people not only manna from heaven, but also the ability to govern their own lives again. In the Asmat, one of the most ingenious of these lived in the village of Ewer. We saw him, a young crippled man with flashing eyes, in the crowd watching our plane come into the airfield.

"His name is Sotor Baptes," said Crosier missionary David Gallus. "He's intelligent and shrewd, and he plays on the dislike of these people for governmental interference with their way of life.

"A few months ago he began telling people he had the power to obtain airplanes and cans of food from a hole in the ground. If they went to church often and prayed hard and believed in him, he said, their skins would turn white, he would become president, and the Asmat would win freedom and independence."

Many believed, and gradually Father Gallus's church became filled at services. But the people stopped fishing and making sago. The cooperative ceased to function, and drums pounded every night.

Then the village chief returned from a trip, discovered what was going on, and reported to the Indonesian authorities.

"The local government head, the military commander, and the chief of police all came over here," Father Gallus said. "They really scared the people. So, at least for the moment, the cult has gone underground."

Magic Banner Flies Again

When finally we left the Asmat to go home, we flew over the village of Ti, the place from which the people had fled when we approached in our canoe.

This time only a few people ran away. The rest stood their ground. I wondered what they were thinking. Did they see in our little Cessna the long-awaited cargo plane?

Apparently not, for suddenly a band of men brought out a tattered flag, the one that had been planted before us on our first, tense visit to the village. The magic banner must have worked a second time: We flew away without harming the people of Ti. □

Legacy of a dead brother falls to Wek, a cane-braceleted tribesman of Basim-Wares. By Asmat tradition, the deceased's home, possessions, and responsibilities are inherited by his next of kin, making Wek the head of two families. On the right, the brother's widow and child now look to Wek for protection; his own family sits at left. Four other related families share the 30-by-60-foot house, each maintaining a separate mud-floored hearth like the one behind Wek. The communal structures enable mothers to work while the aged mind the children. The government, however, encourages construction of one-family homes, and the larger dwellings may soon join a procession of Asmat traditions succumbing to the 20th century.



ON THE ROAD WITH

I STOOD at the "back door" of the tent, the performers' entrance. Beside me, on the bandwagon, the brassy, insistent circus band sounded deafening.

The canvas flap of the back door parted and Rudolf and Gerda Pedrola stepped in beside me, ready to go on. Over their brief costumes they wore heavy robes against the unseasonable April chill that blanketed Eastman, Georgia.

It was near the end of the evening performance of the Hoxie Bros. Gigantic 3-Ring Circus. The Pedrolas, veterans of the incredible world of the circus, soon would be swinging high up near the peak of the big top, performing their dangerous aerial act (page 414). Rudolf was 48, a compact, friendly man with mischievous blue eyes; Gerda was 41 and blond, and she moved with the poise of a star. They were accustomed to the bright



AN OLD-TIME CIRCUS

By JOHN FETTERMAN Photographs by JONATHAN BLAIR

lights and the prestige of center-ring billing.

Rudolf flashed me an exaggerated wink; Gerda's face became a smile of greeting.

"How do you feel?" I asked her.

She leaned nearer against the din of the band. "Fine now," she said.

The night before in Thomasville, Georgia, she had suffered a muscle strain, and I had watched her during the day as she climbed aloft in the empty big top to test herself.

FIVE-TON TROUPER, peering out at the Kentucky countryside, rides to her next engagement with the Hoxie Bros. Gigantic 3-Ring Circus. Eighteen trucks and a fleet of house trailers and automobiles carried the show to nearly 200 one-night stands on its seven-month, 13-state itinerary.





I lack the adjectives, verbs and nouns
To do full justice to the clowns.

—OGDEN NASH

MIRTH PEDDLERS Italo Fornasari and his glittering son Doady (**above**) romp through a comic musical routine. In two shows daily and sometimes three, the









funmakers, called "Joeys" in honor of the great 19th-century jester Joseph Grimaldi, evoke canvas-shaking guffaws. And "children of all ages" (**right**) find that belly laughs come easier when primed with traditional circus fare—popcorn and snowballs. The enthusiasm of American audiences prompted the Fornasaris to come to the United States from Italy 12 years ago.



DON'T TRY THIS with false teeth! Rudolf and Gerda Pedrola's jaw-wrenching act (**left**) depends for success on the muscular aerialists' bulldog bite. Rudolf twirls his wife from a device that both clench only with their teeth. As she hangs, she begins spinning in ever-accelerating revolutions that blur her features, transforming her into a sequined whirlwind.

After more than 25 years as an aerial team, the German-born couple talk increasingly of retiring to their Florida ranch. But they will leave behind the time-honored legacy of circus folk—their offspring. Reared in the world of tinsel and tights, Dagmar Pedrola (**right**), 23, chose a trouper's career "because I just couldn't imagine waking up each day in the same town." Here, at the outskirts of West Jefferson, North Carolina, she sharpens her wire-walking talent on a cable fence.

When she came down, she tapped her shoulder and said in her rich German accent, "It hurts so much—and what I just did was not even a trick." I asked her whether she would perform that night. "Oh, of course," she said quickly. "When the crowd applauds, all your troubles go away."

There was a blast from the ringmaster's whistle, and his voice filled the tent:

"... And now in the center ring, the *sensational* Pedrolas!"

The pair climbed swiftly up the high rigging, and for a few minutes, as they spun and flipped and twirled while hanging by their teeth, Gerda's troubles did go away. So did the troubles of a tent full of circus fans. And that, I discovered, is a part of the daily magic of the traditional American tent circus.

We—my wife, my 15-year-old daughter, and I—joined that circus in late March in Orlando, Florida. For weeks we hopped across the Southeast, each day hurrying past fields and pine-clad countryside shrouded with early-morning mists. We lived in a large motor home in the "backyard," where the performers park their trailers beside the big top, and watched and participated in the part of the circus few fans ever see.

A tent circus, we found, is a heady mixture of hokum, noise, salesmanship, dedication, and talent. It is a fragile thing, at the mercy of weather, mechanical failures, human exhaustion, and the whims of a public oriented to television and the movies. It is a world of tent workers who drift from circus to circus, known only by nicknames: "Whitey," "The Fox," "Bird Liver," "Gypsy Red," "Super Chicken." And it is a life of lost sleep, meals grabbed on the run, and almost daily moves from town to town.



Hoxie Bros. is among the largest of the 15 or so tent circuses that still take to the road each spring in the United States. It employs some 75 people, including 30 performers, and its 230-foot-long big top can seat 2,500 spectators.

In a 29-week season the Hoxie show plays mostly small towns and some hospitals and military bases in 15 states from Florida to Michigan (map, page 421). It sets up in ball parks, on hospital grounds, National Guard Armory lots—anywhere space can be found.

Daily Miracle Touches Chaos With Magic

In our travels with the Hoxie circus I marveled every day at the miracle of transporting tents, animals, and gear fifty miles or more and then reassembling it all in a tableau of controlled chaos.

On our first move with the show we awoke before dawn to the metallic growl and meshing gears of its 18 trucks as they headed toward Ocala. There a friendly morning sun played upon the scene: The lot was alive with tangled ropes and electrical cables, with gear and rigging, with a seemingly hopeless mass of flaccid canvas being unrolled from the huge "spool truck." But somehow, under the hands of shouting men and the tugging of harnessed elephants, the big top stood taut and ready, with banners flying, in time for the afternoon performance (following pages).

That night, while elephants and men took the circus apart in an equally impressive display of coordination and confusion, the owner of the circus dropped by to visit us. It was his first free moment since we had joined the show.

Many circus people literally are born in the circus. But 60-year-old Hoxie Tucker was a

convert who ran away from home at the age of 15 to join a touring tent show.

Now he and his wife Betty, a former acrobatic dancer, own their own three-ring circus. ("Or it owns us," Betty said wryly.)

Hoxie sat in our motor home, keeping an eye on the bustling circus lot, and spoke rapidly of his career. He was a large man with a ruddy, beaming face—the kind of face Santa Claus might have without his beard. A life of ups and downs, as he grew from eager young stake driver to graying circus owner, had made him a sagacious mixture of toughness and gentleness.

"I guess I've made a few quarters in my time," Hoxie told me. He said he had owned a medicine show, a dog-and-pony show, and then a small one-ring circus. Once he had a tent show made up of country singers and musicians. "Had a lot of fun for a while with those hillbillies under canvas," Hoxie recalled. "Friend of mine once called and said he had another young singer for me. I said no thanks—I'd had enough of hillbillies." Hoxie winced at the memory. "Turned out the singer's name was Elvis Presley." That decision had cost him a lot of quarters.

No One Forgets a Purple Truck

Hoxie gestured toward the trucks, all painted purple and all nearly loaded for the early-morning start. "They call this a Sunday-school circus," he said. "Nobody ever sees an X-rated show in my tent."

The purple had been selected by Betty Tucker. "It's my favorite color," she told me. But it has a practical side, too. "Once in a while a driver gets lost, and you have to go looking for him. Nobody ever remembers seeing a red truck or a green one. But they never forget a purple truck passing by."

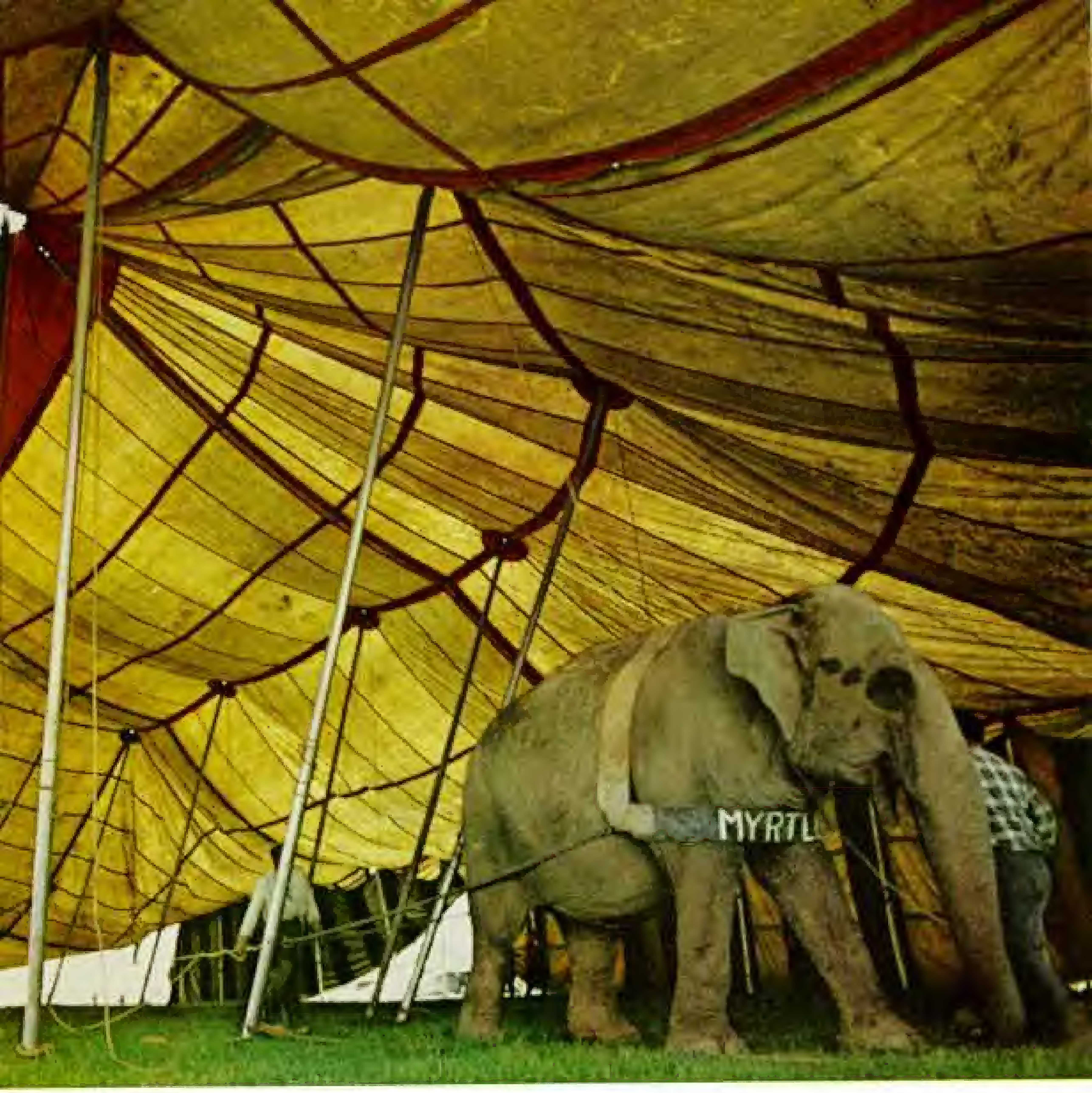
The purple trucks follow purple cardboard arrows, placed the night before. We, too, followed them to find another home each day.

When we reached Perry, Florida, I encountered Italo Fornasari in one of his rare relaxed moments, and we sat under a pine tree and talked. Italo is a small man of 46 with a wispy halo of thinning hair. Out of costume he looks much more like a college professor than a hilarious clown. In the center ring he wrenches shrieks of laughter from the audience when he somersaults on the trampoline and sends his baggy trousers flying skyward.

Italo represents the fourth generation of an Italian circus family (pages 412-13), and he was trying to tell me why he endures the



UP SHE GOES! A frenzied army of men and beasts each day erects the 230-foot-long big top in less than three hours. Young "towners"—local boys who receive free passes for their efforts—help seasoned canvasmen spread and lace together the huge sections of the main tent (**right**), which will then be attached to rings on the poles. Strong as a tractor and more maneuverable, Myrtle (**above**) and others in the eight-elephant herd pull the rigging that hoists the heavy canvas.


MYRTL





Behind
the scenes
in the
big top's
"backyard"





TOUCH OF PERMANENCE in a nomadic existence, the "backyard" of the circus provides an instant, familiar neighborhood at every stop. Here, where performers group their house trailers, the show-business wanderers mix pursuits peculiar to their crafts with domestic chores familiar to any household.

The nimble-fingered Droguett family (**opposite, upper**) use the backyard to



hone their juggling act just before entering the big top at Saltville, Virginia.

The wary step aside when sideshow manager Stu Miller lugs his wife's snakes from the small tent to his trailer (**opposite, lower**). Inside the mobile home, "Serpantina" displays her eight-foot boa constrictor, to the delight of daughter Sissy (**above left**).

Horse-and-dog trainer Eddie Hendricks (**left**) tries to shave without being jostled in the crowded truck trailer he shares with his trained poodles and five elephants.

Warm weather sends Italo Fornasari into the backyard to apply his clown makeup and bulbous red nose (**above**).



rigors of a traveling circus. "You've got to love the circus life," he said. "It's a sentimental life, I suppose. We like to be free. We were practically born under canvas." His four children, all of whom are performers, were gossiping with other circus youngsters nearby. "The little one was born in Butte, Montana," Italo said. "I had to leave my wife there for six or seven days. Then I had to go back 800 miles to pick them up—a 1,600-mile round trip so I don't miss the next night's show."

It was nearing show time in Perry. Italo herded his spirited family into their trailer to dress and gave me his sad-happy clown smile. "We got to make a living," he said.

On those cool, damp mornings of early spring I was delighted whenever I heard the voice of Chona Eastwood calling to me as I wandered around the backyard. "Come have coffee," she would say. Usually she wore two

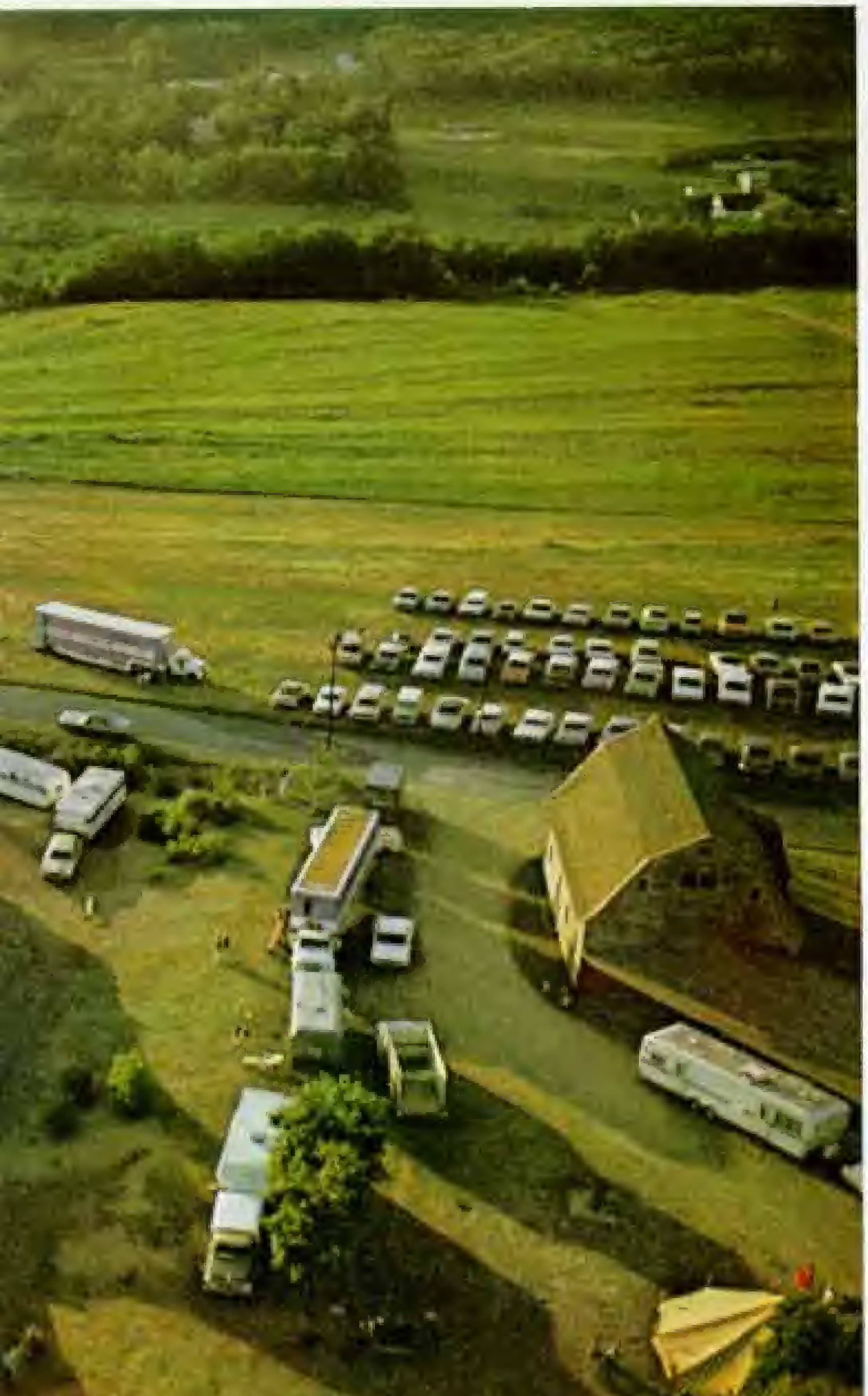


huge rollers in her coal-black hair, the only clue to her daily transformation from backyard housewife to glamorous circus performer.

Chona worked the trapeze and tightwire, and her husband Howard ran the novelty stand, where he sold souvenirs. Chona, a diminutive figure, less than five feet tall, is one of the "Flying Padillas," a circus family of Mexico. "My brother Alexandro, he does the triple somersault," she told me proudly.

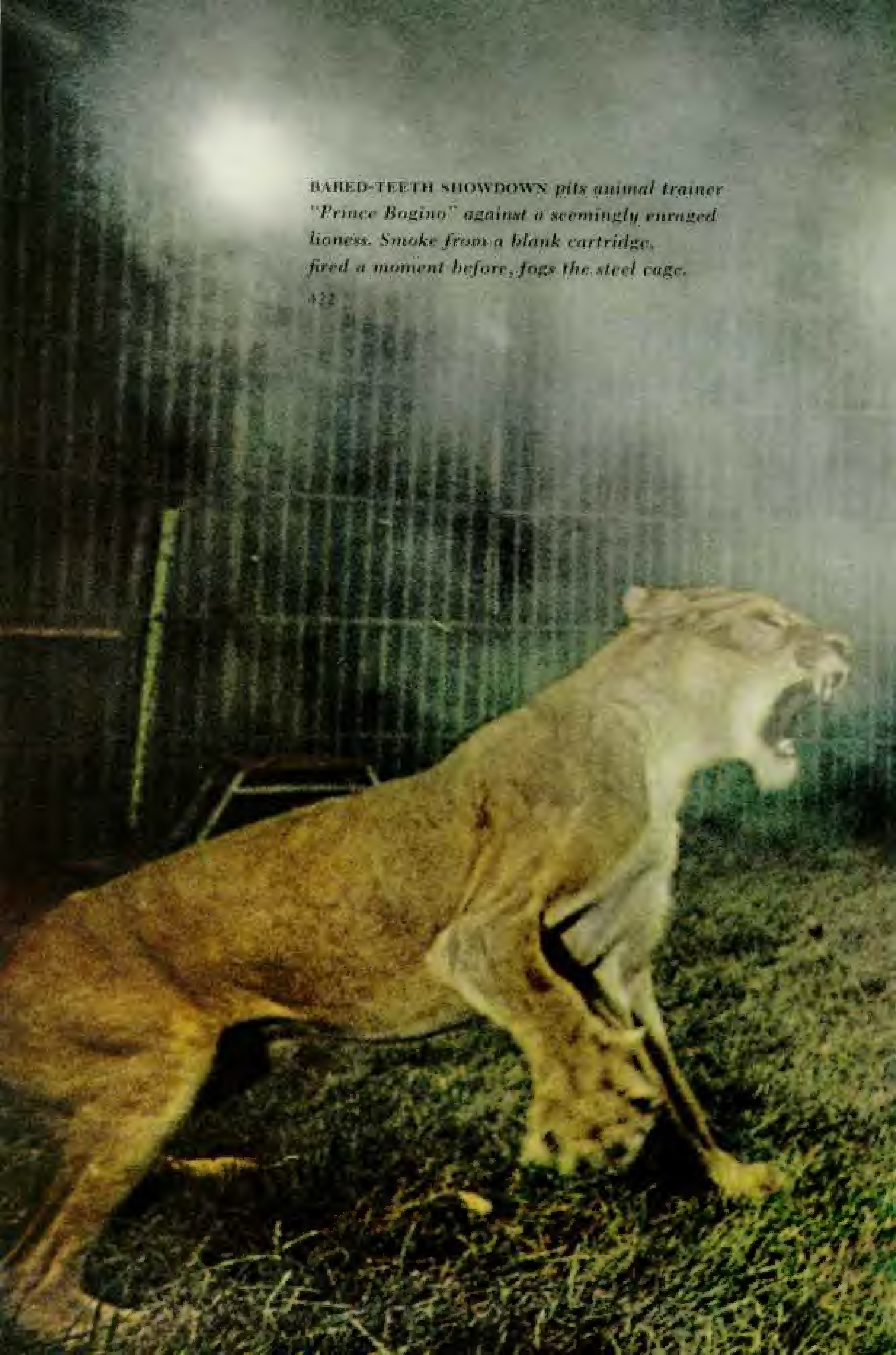
Howard was usually busy with his stand during the show, but I noticed that often he managed to be in the big top when Chona was aloft. Carrying a cluster of colorful balloons, he would join me by the back door. He would smoke a cigarette in short puffs and keep his eyes on his wife (pages 424-5). "She's getting too confident," he would tell me.

Chona was aware of the danger. The winter before she had fallen when a rope gave





TUG OF THE BIG TOP draws townspeople to an uncultivated field near Lehighton, Pennsylvania (**left**). The troupe moves with the first light of day, traveling an average of fifty miles to a new site. The purple trucks follow purple cardboard arrows that bandleader King Charles Weathersby places during the night. Each season the circus covers some 12,000 miles along a zigzag route extending from Florida to Michigan (**above**); it winters in south Miami.



BARED-TEETH SHOWDOWN *pits animal trainer "Prince Bogino" against a seemingly enraged lioness. Smoke from a blank cartridge, fired a moment before, fogs the steel cage.*







BRIEF MOMENTS OF GLAMOR alternate with everyday fears for circus families on the road. Chona Eastwood, one of the "Flying Padillas" of Mexico, exudes an expert's confidence as her chair teeters precariously on the trapeze (**above**). Her husband Howard, a souvenir salesman—a "butcher" in circus language—watches the act from the "back door" of the big tent (**far right**). He remembers the faulty rigging that sent Chona plunging to the ground less than a year earlier. And injuries also afflict nonperformers, as when the Eastwoods' son Wally accidentally gashed his head. He fears the worst as a Kentucky hospital nurse prepares to give him a tetanus shot (**right**).

Like most troupers, the Eastwoods seldom stay with a circus more than a year or two at a time. Visits to the same towns season after season lead circus owners to change their performers often.

way. She was knocked unconscious, but luckily suffered only bad bruises. "It was the only time in my life I fell down," she told me. "I am over it." But she and Howard now made frequent checks of her rigging.

During those coffee sessions in the Eastwoods' gleaming aluminum trailer, Chona tried to focus the conversation on Howard. He is a born salesman, she said, an expert at transferring a balloon, inflated plastic animal, or stuffed monkey into the hands of almost every child on the circus midway.

She told me that they recently had gone to see a movie together. "It was *Love Story*," she said. "We came out of the theater and Howard said to me, 'If I had known all these people would be crying, I would have been out front hustling handkerchiefs.' "

To the performers, one town is pretty much like another; life is confined to the road, the backyard, and the big top. As a fascinated observer, however, I often wandered through the bustling midway or up into the wooden bleachers. And I found circus fans to be truly, as ringmaster Dime Wilson addressed them at the start of each performance, "children of all ages."



Most expressive, to me, were the smallest children, who were too excited even to talk. They simply pointed to the elephants, the banners, the performers, and jumped up and down with squeals of glee. Older spectators often included fans who try to see every circus that comes anywhere near their hometowns.

On the midway at Ocala I talked with Le Brone Harris, who teaches accounting at the University of South Florida in Tampa. "I wouldn't miss it," he said. The next day he planned to visit another circus in another Florida town. I asked him why and he told me, "I never get tired of the magic of putting it up and taking it down every day."

At Eglin Air Force Base in north Florida, a gaggle of jet pilots watched the big top being put up and asked whether it would be "possible to speak to the performers." Later I saw them, groomed and ribbon bedecked, almost shyly asking questions of the performers in the backyard. And eagerly collecting autographs.

Lion Trainer Doubles as Mechanic

A circus, however, is more than people. Animals often steal the show. The first act on the Hoxie program was billed as "America's foremost trainer of savage jungle beasts, Prince Bogino," and his lions and tigers (pages 422-3).

Bogino's real name is Manuel Ruffin, and the people in the backyard call him Junior. He is a big man, six feet tall, and weighs 240 pounds. Outside the cat cage, he also is a quiet, friendly man.

I learned that the place to look for Junior was beneath a truck or trailer, surrounded by oily parts. He was the best mechanic with the show, and his services were in great demand. While he sat on the sandy soil of north Florida fussing with a leaky gasket, he told me of his start in the circus business.

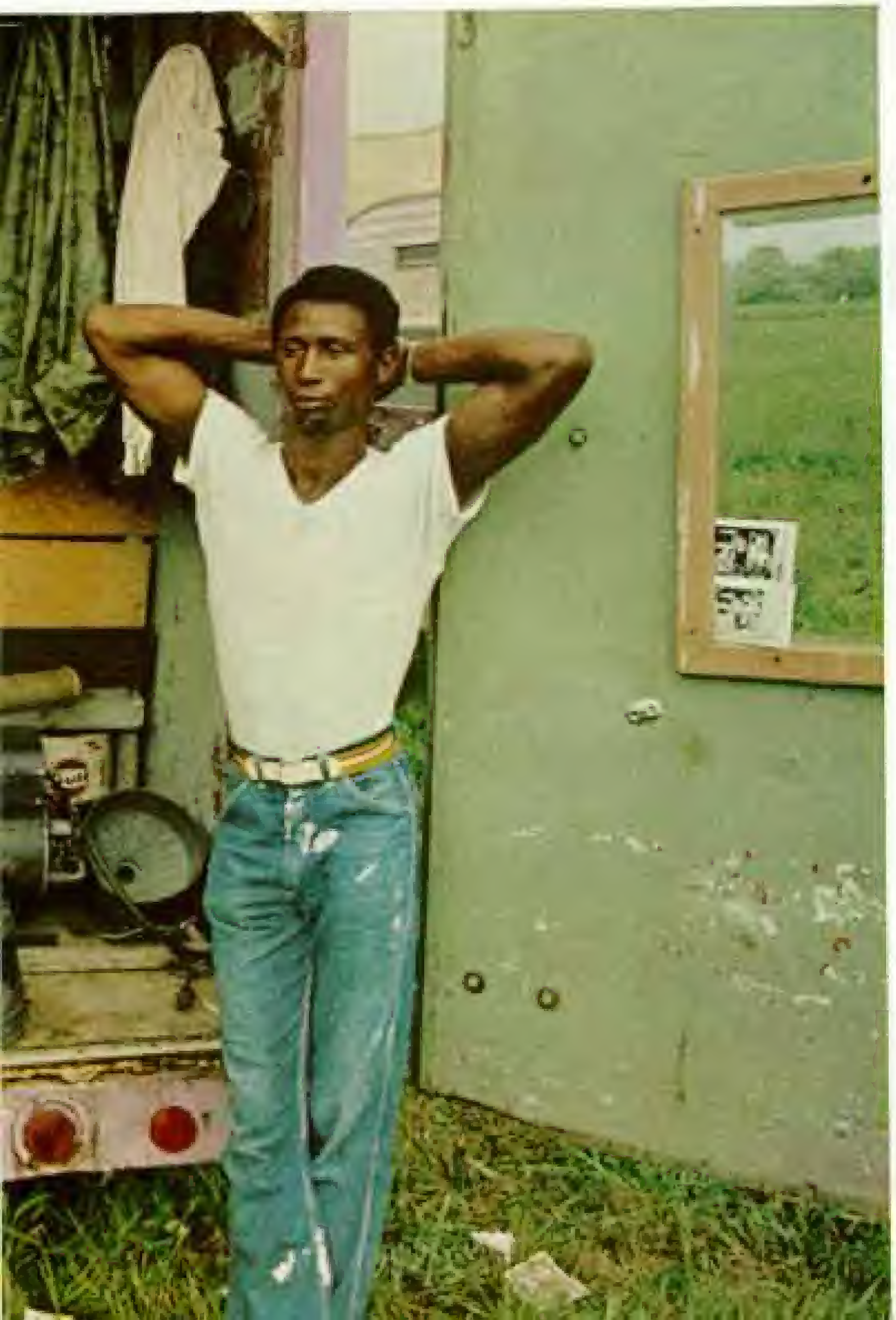
Junior learned about cats from the immortal Clyde Beatty and still referred to him as "the greatest performer of all time." He wiped his hands on an oily rag and told me, "I trained cats for Beatty. Whatever he wanted . . . roll over . . . jump through fire." Then Junior went on his own in 1957.


ZOO ENTRAN


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AT THE "HOXIE HILTON," the irreverent nickname roustabouts gave their bunk-equipped truck (**left**), workers snatch a few moments of rest between performances. A lone workman (**above left**) sacks out at the entrance to the sideshow.

On the lowest rung of the big top's social ladder, the laborers nevertheless make the circus possible; without them the show couldn't move.

Only the elephants work as hard. Bonnie (**above**) pulls the circus owners' car and house trailer through the mud of an otherwise impassable meadow. Carrie, at 72 the oldest Hoxie elephant, has been in circus life more than 60 years.

As Junior and his cats opened the circus with drama and excitement, Tom Armstrong and his elephants closed it with pageantry and humor (pages 432-3). Each elephant had its distinct personality, and they worked as hard as the humans. Between shows, in unglamorous harness, they hauled up the center poles, pulled stakes, towed trucks out of the mud, pushed balky vehicles with their heads. To the people in the backyard the elephants were friends. I, too, soon found myself greeting my favorite with a casual, "Hi there, Myrtle."

As the big top came down each night, the elephants scavenged the lot with their trunks, picking up dropped peanuts and popcorn and candy apples like vacuum cleaners. During one evening performance we sat in our motor home by the back door watching the elephants go in for their finale. My wife gasped and pointed. Myrtle was entering the big top triumphantly holding the bag containing our garbage. Fortunately, she ate it before the act got under way.

On a cool, wet morning in Thomasville, Georgia, one of the elephants developed a chill, and trainer Tom Armstrong calmly fed her a bag of onions. It is an almost infallible cure, he assured me.

"Once I went to a supermarket and bought every onion they had," he recalled. "They



asked me, 'Why are you buying all those onions?' I don't think they ever believed me, but I told them the simple truth. I said I had a bunch of elephants to warm up."

Midway Holds Key to Profit or Loss

A circus might be incomplete without its elephants, but it almost certainly would be insolvent without its midway—the noisy carnival-like area outside the main entrance. That is where concessionaires sell hot dogs and balloons, cotton candy and souvenirs. Most important, that is where the sideshow is, and the sideshow often means the difference between profit and loss for the season.



Stu Miller ran the Hoxie sideshow, and about 30 minutes before show time I would go to the midway and watch him make his pitch. He is one of the best in the business.

Stu is a neat, portly, serious man, and when he mounted the platform in front of the sideshow, he was flanked by a fire-eater, a sword-swallower, and his attractive wife Pat. Pat was billed as "Serpantina," and she was attired in a brief, glittering costume and a boa constrictor (page 419).

"The main show will not open for half an hour yet," Stu told the crowd in his low-key, friendly voice. "This is where you start. This is where you begin to enjoy the big circus." He ticked off the animals inside: monkey, bear, elephants, snakes.

"If you have little children, for gosh sakes don't deny them the fun of feeding a peanut to an elephant."

By the time he finished his soft sell, spectators were lined up outside the sideshow tent waiting to part with an additional 50 cents to see the sword-swallower and magician and fire-eater and others perform before the main show began.

One afternoon a sudden Georgia rain swept across the lot, and we talked in the Millers' trailer. "A good concessionaire is like a performer," Stu told me. "None of this 'Hurry-Hurry-Hurry.'" He handed me a cup of coffee, reaching over to where I was sitting gingerly on a bright yellow box. An electric cord ran inside the box to a heating pad. Pat's 14-foot python lived in the box, and pythons, she explained, "do not care for chilly weather." She is a skilled equestrienne, and working with snakes is not her first love. "Pythons have needle-sharp teeth," she told me, "and if I ever get bitten, they're going to have to find a new snake charmer."

The fever of circus time is generated to a great degree by the band, led by King Charles

CIRCUS-HAPPY KID GROWN UP, Hoxie Tucker—who with his wife Betty, left, owns Hoxie Bros.—returns in triumph to Somerset, Kentucky, the town he fled for the circus life 45 years earlier, at age 15. An affable dynamo, Tucker commands his employees' respect. "He's a stern man to work for," a performer commented, "but he's totally honest."

Weathersby. King Charles is 43 and has been a show-business trumpet player since he was 14 and went on the road "to blow with the Sugarfoot Minstrels." Now, he told me with pride, "I am the first Negro to lead a band in a main circus performance."

With his trumpet, he could change the mood of the circus instantly: an ominous, minor-key phrase to heighten suspense as a wire walker performed; a chromatic scream to enhance the finale of a juggling act.

It was King Charles who traveled ahead of the circus each night marking the route with those purple cardboard arrows. He left the lot around 1 or 2 a.m. as others were finishing the loading of tent and gear, and started for the next town.

One morning when I, too, was moving ahead of the circus, I came upon King Charles around 3 a.m. on a lonely mountain road near the Virginia-Kentucky border. He pulled off the road, and when I did not pass, he climbed out of his white Oldsmobile with great dignity and approached me in the dark. When he recognized me, he laughed with relief and said, "I thought you were the sheriff."

Sheriffs and police are a minor hazard for King Charles. Often they are suspicious of a man hurrying down the road in the hours before dawn, placing mysterious symbols along the way. Once he was fastening an arrow to a post near a service station when police converged on him and held him an hour for questioning. A robbery had been reported at the station.

"Now when I see police at night, I start talking first," he told me. "I ask if there are low bridges ahead. I say I've got big trucks coming through, and if I don't get these arrows up, there's going to be one big traffic mess."

No one else wants his job, King Charles said. "No sir. Dogs bite, and once I reached across an electric fence and got a terrible shock. Once I stepped into a duck's nest. And

Gala welcome to circus patrons, the spectacle that opens each performance



the thunderstorms are the worst. One night I stapled an arrow through a live wire on a utility pole—and started a fire."

Still, he always managed to mark a clear trail before the first trucks moved at dawn. By then he was usually on the new lot, dozing in his car, waiting for the circus to join him.

Short Circuit Damages a Lifeline

By the end of April, the circus had reached the hilly country of Appalachia. On a gusty morning I found Rudolf Pedrola sadly inspecting a damaged cable. In addition to their aerial act, his wife Gerda performs a "slide for life," speeding down a long cable from the top of the tent, hanging by her teeth. That day while the rigging was being set up, a bare electric wire had brushed the cable, scorching and breaking several steel strands.

Rudolf and I located a mining supply firm near Pikeville, Kentucky, and he carefully examined several spools of heavy cable. At length he selected one, bending the cable in his powerful hands. "It is strong, and see how flexible," he told me.

The salesman watched silently, and Rudolf fixed him with a stern look from his blue eyes and asked in exaggerated seriousness, "Would you let your wife slide down this cable by her teeth?" The startled salesman nodded a tentative affirmative. "Good!" Rudolf cried, feigning great joy. "I take it!"

As the Hoxie show moved from town to town, I began to share the feeling of home and of being among friends. It was hard to realize that today's backyard was many miles from yesterday's. Each trailer had its long power line stretched toward the circus generator truck like an umbilical cord; each trailer was a home. And above the humming generators I could hear laughing and talking in a rich blend of accents and languages.

Dime Wilson, the ringmaster, summed it up for me one evening: "Look there. All

brings virtually all the performers and animals parading in review.



nationalities; all languages. Too bad the rest of the world can't get along like we do."

But still the problems were there each day. There was no time to be sick, or even to feel bad. No family doctor. Little time to shop. Vexing mechanical failures with cars and trailers. The weeks on the road placed harsh strains on individuals and families. But tempers rarely flared, and I heard little grumbling.

Emergencies could strike at any time. One busy afternoon in Kentucky I was "drafted" by Howard Eastwood to help out in his novelty stand. Chona's agitated face suddenly appeared, and she shouted in Spanish. Howard ran toward their trailer, and I followed. Their 6-year-old son Wally had suffered a bad gash in his head while playing with other circus children. In minutes we were on the way to the local hospital.

Chona, with bright splotches of her circus makeup still around her eyes, seemed strangely vulnerable and out of her element in the impersonal white glare of the emergency room. Wally, like any 6-year-old, was protesting violently (page 424). There were questions by the doctor and forms to be filled out. Chona's answers were mostly negative. Wally had received none of the usual inoculations.

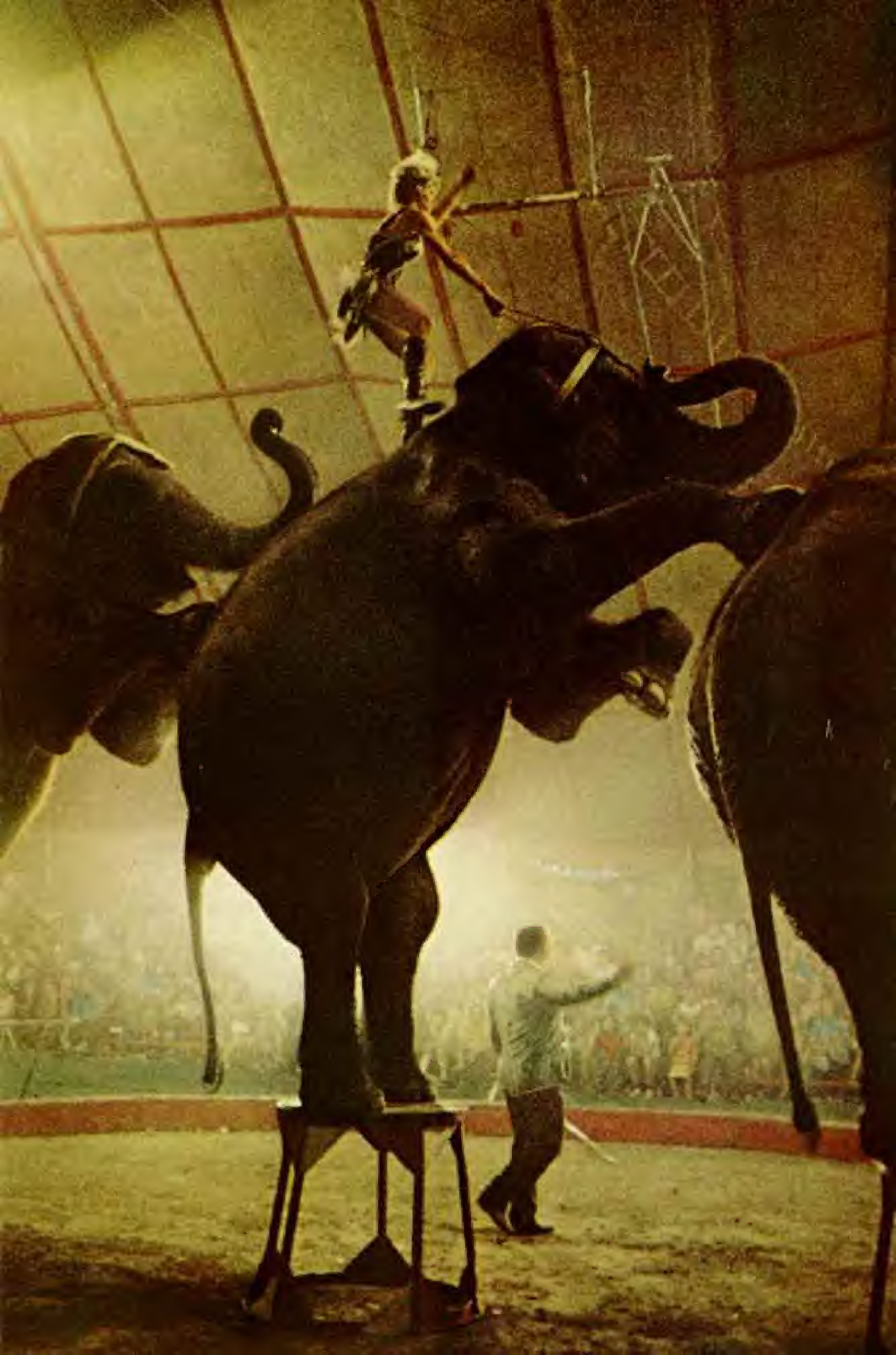
Chona turned to me and said: "We are on the road so much. Maybe Wally will get his shots this fall . . . maybe he can stay in Florida and start to school . . . maybe he will have a regular doctor . . . maybe. . . ."

Why do circus families do it? As we hurried back to the lot for the evening performance, Chona told me, "When you've been in the circus, you just do; you just love it. I don't believe I can ever quit the circus. I love it."

I had discussed this dedication earlier with John Hurdle, curator of the Ringling Museum of the Circus in Sarasota, Florida. Hurdle showed me the museum's re-creation of a circus backyard and said: "When the former circus people come here, it's almost painful,



SIGNALING THE END of two magical hours, Hoxie's elephants rise to the "long mount" on orders from Tom and Juanita Armstrong. Filing out of the big tent, wistful spectators will agree with Ernest Hemingway that the show is "the only ageless delight that you can buy for money. Everything else is supposed to be bad for you. But the Circus is good for you."



They come into the backyard here and they stand and look, and say, 'Oh, oh. It was hard but it was wonderful.'"

I mentioned the aerialists' constant peril.

"Almost all of them have fallen and hurt themselves—some badly," Hurdle said. He said that he, too, had asked performers why, "after being broken to pieces," they are compelled to go back and do it again.

"I suppose you expect some stirring answer," the curator said. "But a wire walker says simply, 'I got to make a living.' It's that simple. And why do men go into cages full of wild animals?"

He showed me an autographed picture of the aerialist La Norma. In the picture, she was swinging gracefully from her trapeze. But later she fell and spent many weeks in the hospital.

"I asked her, 'Why, in heaven's name, do you do it?' She said, 'This is what I know.' Lying there in that hospital bed, semiconscious, still in a cast, she had reached up and grabbed the bar they put there to help her turn over and had begun to work again."

Hometown Crowd Fills Every Seat

I left the circus briefly and returned to it on the first of May—an inappropriate date to be with Hoxie Tucker, the veteran. In circus slang, "first of May" means a rookie, a beginner. On that day, the circus was playing Somerset, Kentucky, Hoxie's hometown, the town he fled 45 years earlier as a tent-struck boy.

Until time for the afternoon show, Hoxie was like a man possessed. Covering ground rapidly with his loping gait, he was everywhere, and I had difficulty keeping up with him. He retied knots, ordered stakes moved a few inches, dickered with deliverymen, helped blow up balloons, checked lighting and rigging, inspected every corner of the lot.

Then he and Betty manned the two gates to the big top (pages 428-9). Hoxie was jubilant as his practiced hand gathered tickets and kept the line moving. "Hey, you old Democrat!" he yelled to a hometown friend. "Thank you, young lady," he said to a gray-haired matron, and gave her an impish wink. She tittered and gave him her ticket. Every seat in the tent was filled, and the show was a huge success.

It rained that night in Somerset, and Hoxie awoke at 4 a.m. to a muddy lot and a frustrating day. A tractor unit broke down—a vital one, for it pulled the trailer laden with the big top's four center poles. Dozens of phone calls and pleas finally turned up a driver with a tractor in another town, but it was hours before he appeared.

So Hoxie had time to shove his broad-brimmed hat back and reminisce about his boyhood spent only a few blocks away. He was always running away from home, he told me. "They named me Leonard and put me in long curls and dresses when I was three years old. So I ran away. They had to tie me to a clothesline. The day my dad died he said to me, 'You were a good boy. You just never would stay home.'"

Purple Arrows Guide a Dream Come True

Hoxie began to pace. "I've had more fun than any human," he said. "If I drop dead tomorrow, I wouldn't mind... if it wasn't for Betty."

It was 4:30 in the afternoon when the pole truck finally was sent on its way north to the next lot in Ohio. Then Hoxie and Betty left in their gold-colored Cadillac, towing their trailer. As they drove around the town square, the sun burst through the clouds.

Hoxie was smiling, and he never looked back at his hometown. That day Hoxie was not a green youth of 15 running away in pursuit of a vague dream. He owned his dream, and it was stretched out on the road ahead of him in 18 purple trucks, following purple arrows, moving north with the season. There would be winds and rain to tear at his tent, workers and performers would quit under the stress, mechanical and human failures would beset the circus. But there also would be sunny days and big crowds and a few quarters to be made.

I left Hoxie and Betty Tucker at the edge of town. I told them good-bye, but Hoxie's big voice promised, "We'll be seeing you down the road." □

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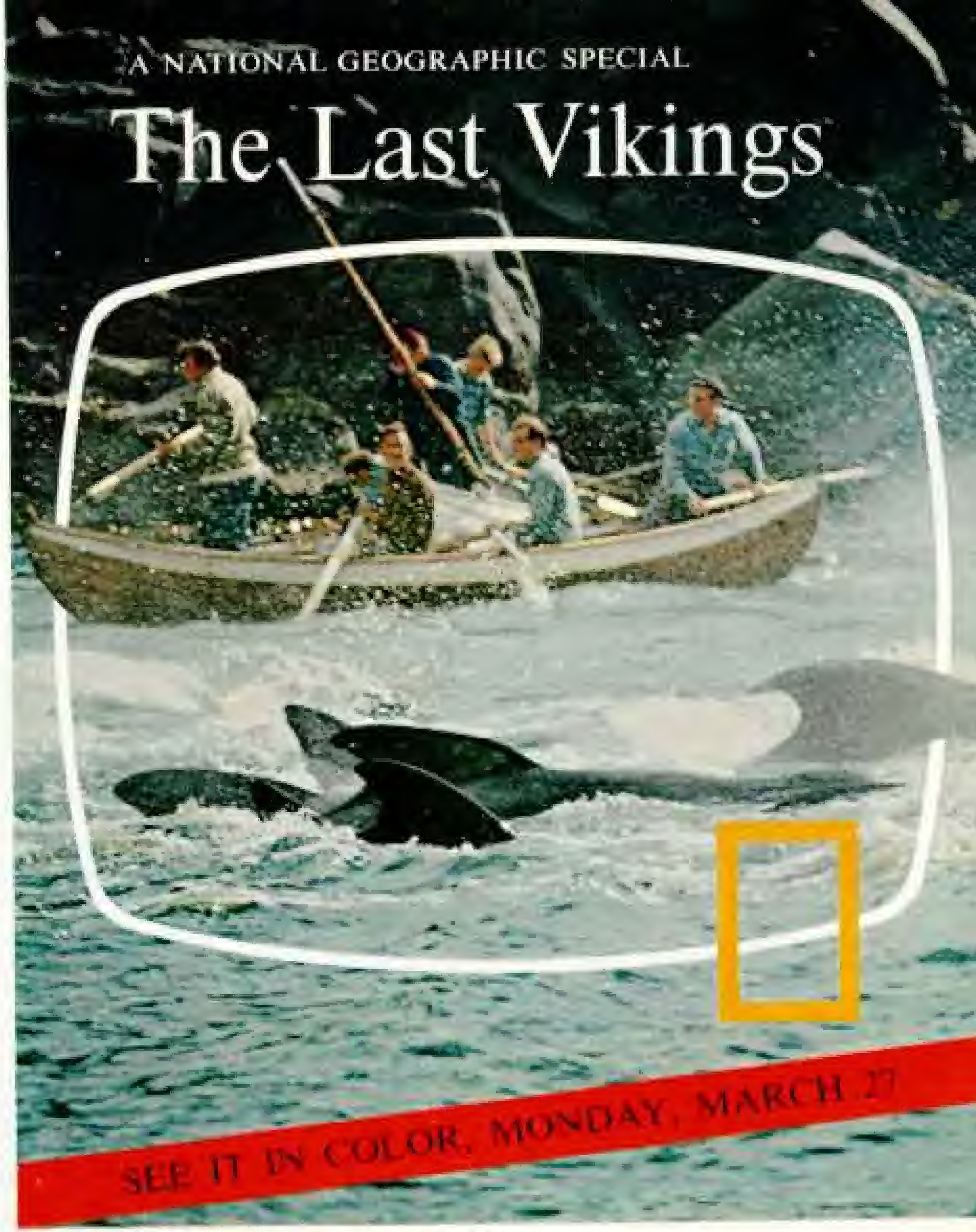
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Voyaging with modern Vikings

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The camera leads you to teeming North Atlantic fishing grounds as men in ships of steel take cod and halibut in today's peaceful conquest of the ocean. Yet the art of constructing the graceful high-prowed wooden vessels of old endures (**below, center**). And with the same daring spirit that carried their ancestors across the Atlantic, brave Faeroe Islanders dangle from ropes hundreds of feet above the water to gather the eggs of cliff-dwelling birds.

Leslie Nielsen narrates "The Last Vikings," produced by the National Geographic Society in association with Wolper Productions, Inc.





Ocean harvest keeps modern Norsemen married to the sea. A crewman hauls a fish aboard the Norwegian vessel *Lestaskjer* (**top**). A 13-million-dollar bonanza of fresh fish pours annually into sea-fretted Ålesund (**above**), one of Norway's largest fishing ports.





Fire rekindles fellowship at the Midsummer Eve festival on Norway's island of Godøy (**above**). Like their Viking forefathers, villagers gather around driftwood bonfires to celebrate the year's longest day. Costumed characters in a parade to the beach include a child "bride and groom" (**top**).

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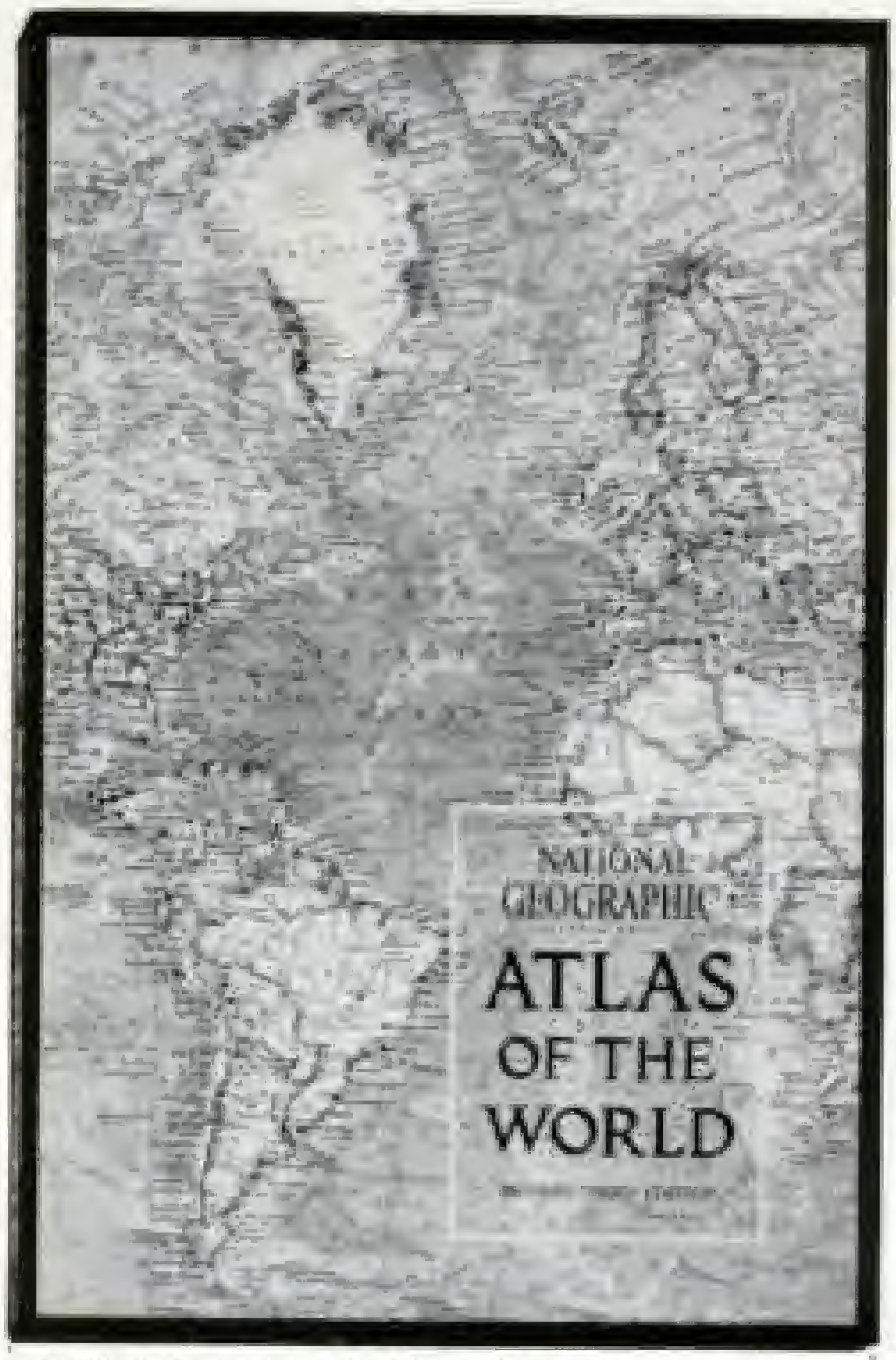
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